24 HOLIDAY GIFT IDEAS

MODEL AIRPLANE NEWS

THE WORLD'S PREMIER R/C MODELING MAGAZINE

48120

GAIN CONTROL

Flight-Trimming Tips

—page 46

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FLYING ACES NATIONALS

Best of Free Flight Scale

December 1998

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CONTRIBUTORS
Dave Baron, Rick Bell, Joe Beshar, Mike Billinton, Bernard Cawley, Roy L. Clough Jr., Hal deBolt, Don Edberg, Guy Fawcett, Dave Garwood, Dave Gierke, Greg Gimlick, Henry Haffke, Greg Hahn, Tom Hunt, Michael Lachowski, Mike Lee, Andy Lennon, George Leu, Mike McConville, Jerry Nelson, Jim Newman, Jim Onorato, Dan Parsons, Dave Patrick, Dave Platt, Roger Post Sr., Randy Randolph, Jef Raskin, Carl Risteen, Jim Ryan, Jim Sandquist, Keith Shaw, Jim Simpson, Faye Stilley, Craig Trachten, Bob Underwood, Roy Vaillancourt, George Wilson, Nick Ziroli.

AirAGE
100 East Ridge, Ridgefield, CT 06877-4606 USA
(203) 431-9000 • fax (203) 431-3000
Email *man@airage.com*
Internet *www.airage.com*

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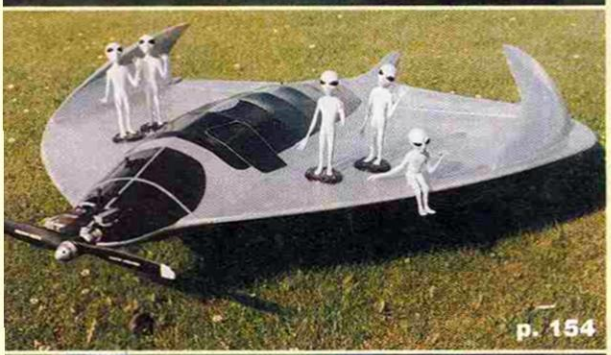
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***ON THE COVER:** main image—Dave Rees's Plage-Court Torpedo in flight over the Flying Aces Nationals; inset—Aerocraft Staudacher (see "Trim your Model for Precision Aerobatics" to get your bird flying straight and true).*

***ON THIS PAGE:** top—Sid Miller's Pietenpol is this month's construction article; center—Is this a scale model?; bottom—Don Srull's Santos-Dumont canard is a fine example of the models flown at the Flying Aces Nationals.*

Features

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Construction

Columns

Departments

by LARRY MARSHALL

GROWING OLD OR CHANGING?

FROM MY discussions with people over the last year there seem to be many who believe that our hobby is growing old, that no new people are taking up model aviation and that the hobby will simply decline due to lack of interest. These discussions typically refer to the "graying" of our hobby. But is this really true? I think not.

I have the opportunity to attend many different types of model aviation events and what I've seen is counter to this common view. It's certainly the case that, when I attend giant scale fun fly events, the majority of participants are as old as I am or older than me. But when I was at an electric fun fly in Michigan this year, the guys filling the flightline were mostly younger than I—in their 30s and early 40s. The same thing was true when I attended two helicopter events this year. Jet rallies seem to attract many young people; they aren't teenagers, but they are in their 30s. Even the Flying Aces Nationals free flight scale event had its share of young participants, and those participants were picking up a lot of the hardware at the awards banquet.

As an instructor, it's been the case that over the last few years, most of my students have been in their 30s or 40s. If this is "entry level," that's not an indication of "graying of our hobby"; it's a reflection of the demographics of our country as well as the realities of life. These days, most adults stabilize their lives and families at this age and so they finally have the time to participate in hobbies. I suspect that we would find similar trends in golf.

In talking with Jay Mealy of the AMA, their latest survey showed that the mean age of their membership was around 45—significantly lower than it was the last time the survey was done. This, I think, is a reflection of what I'm seeing on the flying fields. Their membership is also up by 3 percent this year, by the way.

So people who are joining our ranks are in their 30s and 40s, and if they seem to end up in venues other than giant scale rallies, does that suggest that *giant scale* is graying and not the hobby? Maybe parts of it are, but there continues to be an interest in giant scale on the part of younger folks. One look at the growing popularity of IMAC competitions gives a good indication of the interest in giant scale aerobatics, and much of it is coming from guys in their 30s and 40s. The same thing can be seen at many of the warbird meets.

In short, I see considerable evidence that this generation, unlike those that preceded it, are simply entering our hobby at an older age than many of us "old-timers" entered the hobby. These younger folks seem more diversified in their interests than those of us who are more set in our ways. Hence, we are seeing a surge of interest in helicopters, electric power, scale aerobatics, smaller aircraft and even free flight. These varied interests may change the nature of our hobby, but from what I can see, we're seeing an exciting influx of new participants in model aviation. This bodes well for the hobby in general.

NEW HELICOPTER COLUMN

Because R/C helicopters are growing in popularity, we've decided to initiate a bimonthly column on the subject. We were fortunate to have Rick Bell agree to write the column; he has been my instructor as I've tried to learn something about helicopters and helicopter flying. His abilities to explain helicopter setup and flight are well above average. As for Rick's flying abilities, he spent several years on the competition circuit and has a wall full of trophies, including first place at the 1992 AMA Nationals. While he still flies his competition helicopters, he's devoting more of his time to scale helicopters these days. Take a look at his .90-size Hughes 300 in his first column, "Regarding Rotors," and you'll see that he's quite a craftsman. But, maybe best of all, Rick is a nice guy, so if you bump into him, introduce yourself, as he loves to talk helicopters.

AirSCOOP

by CHRIS CHIANELLI

New products or people behind the scenes; my sources have been put on alert to get the scoop! In this column, you'll find new things that will, at times, cause consternation, and telepathic insults will probably be launched in my general direction! But who cares? It's you, the reader, who matters most! I spy for those who fly!

SAITO .30s

Saito's new .30S is being touted by its distributor, Horizon Hobby Distributors, as a "small wonder." If the .30S has performance and reliability similar to those of others in the single-cylinder Saito line, this claim may be more than just hype. The Saito .30S is designed to give small-scale modelers the same 4-stroke torque and sound as larger-scale modelers have enjoyed for years. This engine is ideal for kits such as House of Balsa's PT-19, Lanier's .25-size Extra 325, or any other .20 to .25-size kit.

Like its big-brother Saitos, the .30S features: one-piece head/cylinder design for superior cooling and more room for machining larger, higher-performance valves; true AAC technology (aluminum ringed piston and chrome-plated aluminum sleeve); and a three-year warranty.

Also available is a classy Golden Knight version that features matte black cylinders and gold-plated valve covers.

Distributed exclusively by Horizon Hobby Distributors, 4105 Fieldstone Rd., Champaign, IL 61822; (217) 355-9511, ext. 227.

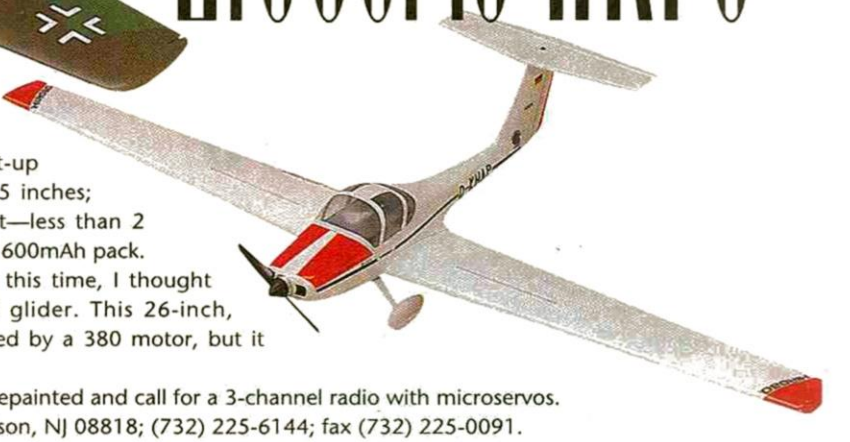
2–NEW from Futaba

Here's a sneak peek at the latest from Futaba. The Skysport is now available in a 6-channel version—the T6YF—that features servo-reversing, throttle ATV, a retract switch and a flap knob. The "S" version—stands for "Super"—of the T8UAP 8-channel radio is available in aircraft and helicopter versions. Some of the S series' new features are: individual side adjustment for both dual rate and exponential on aileron, elevator and rudder; programmable mixing on 7 channels; digital trims with "change of neutral" buzzer warning; programmable trainer function; and governor mixing and gyro mixing for normal mode and conditions mode (heli only). Stay tuned for more on these radios.

Futaba Corp. of America, P.O. Box 19767, Irvine, CA 92723-9767; (714) 455-9888; fax (714) 455-9899.

HIROBO

Electric ARFs



First up is the twin, 380-powered Dornier 335. This features a fiberglass fuselage and a fully sheeted built-up wing. Specs: wingspan—32.25 inches; length—27.5 inches; projected weight—less than 2 pounds; battery required—8.4V 500- to 600mAh pack.

Though few details are available at this time, I thought you'd like to see the Grob powered glider. This 26-inch, 51-inch-wingspan model is also powered by a 380 motor, but it requires a 7.2- to 8.4V 600mAh pack.

Both the Dornier and the Grob are prepainted and call for a 3-channel radio with microservos.

Altech Marketing, P.O. Box 7182, Edison, NJ 08818; (732) 225-6144; fax (732) 225-0091.

MEISTER/BROWN

Me-109

This 84-inch-wingspan Me-109 designed by giant-scale expert Ty Brown is now offered in short-kit form by Meister Scale. The kit includes formers, foam wing-cores, spinner, canopy and plans. The 18-pound model is reported to fly well on a Quadra Q42.

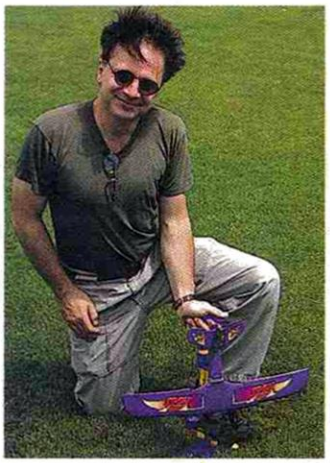
Meister Scale, 6319 N.C. 49, Mebane, NC 27302; (910) 562-3700.

MATCHING PAINT ...

... for WW I Lozenge

Arizona Model Aircrafters now offers custom-mixed acrylic enamels to match its iron-on, five-color WW I German/Austrian "lozenge" fabric. Top Gun champion and WW I expert Tom Polapink helped Arizona to reproduce the colors as accurately as possible. These paints are not produced with the standard process; instead, they are computer-matched using a process similar to that used by high-end European auto-body paint shops.

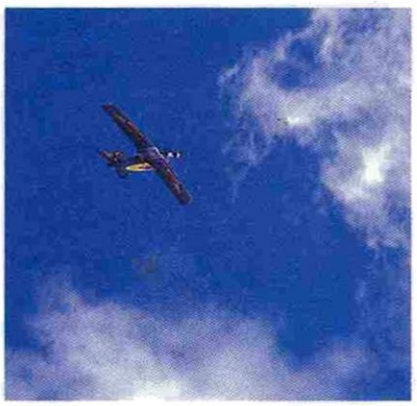
Arizona Model Aircrafters, 14795 N. 78th Way, Unit #800, Scottsdale, AZ 85260; (602) 348-3733; fax (602) 348-3773.



A boy and his hog

Here's yours truly pumping up the engine on one of Spin Master Toys Air Hogs.

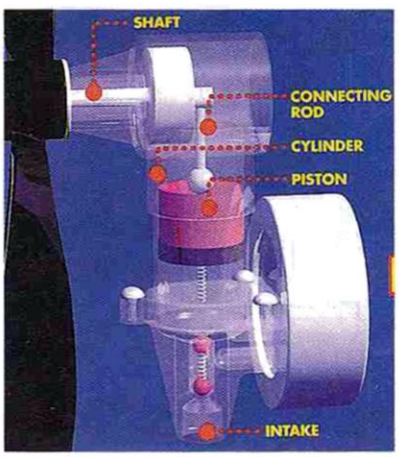
I know, right now you're asking, "Why is he putting a toy in 'Air Scoop'?" Well, every so often, something that's quite interesting and usable in our R/C hobby comes from the toy industry. Air Hogs happen to be such things—no, not the ARF foam airplane itself, but the air-pressure engine that powers it.



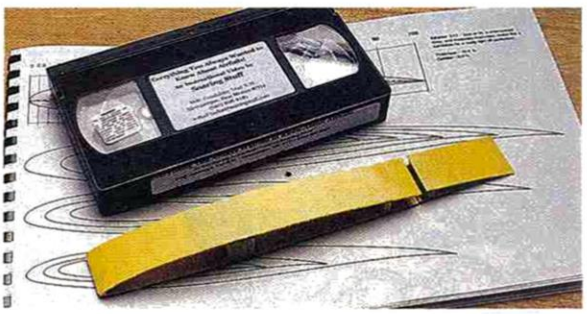
When I pumped up the plastic air tank, the engine really did put out enough thrust to carry the model the length of a football field—just as promised on the box.

As you read this, two of our more inventive contributors are building a slow-flying indoor/outdoor R/C model using an Air Hogs engine (and a 1-liter soda bottle to increase duration). Rumor has it that they have worked out an on/off motor control. I'll keep you posted. As for my own Air Hog, it flew into the highest tree in town, and I've been kicking a can in a big sulk ever since.

Spin Master Toys, 250 The Esplanade, Ste. 400, Toronto, Ontario, Canada M5A 1J2; (416) 364-6002; fax (416) 364-8005.



ITTY-BITTY Hardware



Everything about airfoils

This new video, "Everything You Always Wanted to Know about Airfoils," was produced in cooperation with Dr. Michael Selig and the University of Illinois Low-Speed Airfoil Testing Program. In layman's terms, it explains all aspects of airfoils, including how they work, how to evaluate your models' existing airfoils and how to choose the proper airfoils for future projects. Fascinating computer-generated animation and live video footage illustrate wind-tunnel testing and show you how to use wind-tunnel-test graphs to match an airfoil to an intended task with a minimum of mathematics. By covering everything from the basics—chord line, camber and thickness percentage—to more sophisticated concepts—airspeed effects, Reynolds numbers and angle of attack theories—this tape demystifies aerodynamics. Part of the proceeds from the video sales will be donated to the research work of Dr. Selig and his team.

Soaring Stuff, 9140 Guadeloupe Trail N.W., Albuquerque, NM 87114; phone/fax (505) 898-8281.

AIRWAVES

WRITE TO US! We welcome your comments and suggestions. Letters should be addressed to "Airwaves," **Model Airplane News,** 100 East Ridge, Ridgefield, CT 06877-4606; email **man@airage.com.** Letters may be edited for clarity and brevity. We regret that, owing to the tremendous numbers of letters we receive, we can not respond to every one.

LIKES THINKING BIG

I really enjoyed your new column in *Model Airplane News.* I am rather new at flying large planes, having flown a Sr. Telemaster for the first time last year. It is a very good entry-level plane for large scale with its 96-inch span and low cost. Although it is made for .60 engines, I am flying mine with a Thunder Tiger 1.20 swinging a 16x6 Master Airscrew classic prop, and I am very satisfied with its performance. It weighs about 13 pounds, and around 20 pounds with ¼-scale floats, it handles quite nicely. I also fly a large biplane; although it can't be considered giant, it is big for me. It is the Altech Stearman with a 58-inch span, and it's powered by a Magnum .91XL. It is also a joy to fly, and the .91 powers it rather impressively.

Thanks for a great column, and don't let the IMAA-legal crowd deter you. In this hobby, it is becoming more and more a mentality of "us against them," and isn't the only reason most of us fly is to get together and have fun?

RANDALL L. HUSTON
Bolckow, MO

Randy, it does seem that, regardless of our own passions, we modelers sometimes do become so engrossed in what turns our crank that we easily lose sight of the whole picture. "Big" is relative, and the "Thinking Big" column is aimed at sport flyers who build and fly bigger than "normal" models. The IMAA-legal crowd has been very supportive of my column even though I haven't drawn an 80-inch-long line in the sand. I do agree with you that, above all, we are trying to have fun, and I don't think fun should have a size restriction. GY

ENJOYS HIS 3W-24W

Within the past year, *Model Airplane News* reviewed the 3W-24cc single gas engine. Based on this timely review, I purchased one of these engines to evaluate its usefulness in my research project: sampling the lower atmosphere for the movement of insects and plant pathogens. What a powerhouse! This 1.45ci engine recently pulled a 27-pound Sr. Telemaster on floats off smooth water (wing loading 46 ounces/square foot) and flew it at 40mph. In addition to floats, the plane also had two air-sampling collectors slung beneath the wing. Flights were 30 minutes in duration and full-power fuel use (gasoline) was less than 1 ounce per minute. Thirty-two ounces of fuel give 35 minutes of full-power flying.

The engine performed flawlessly during the entire 40 sampling flights (20 hours) turning a 20x8 Master Airscrew classic prop at 6,200rpm and seemed to get stronger with use. This engine generates as much power as the 1.8ci SuperTigre 3000 converted to diesel, has better fuel economy and is much more trouble-free. Based on this amazing performance, I purchased two more engines that were hard at work mounted on Sr. Telemasters (take-off weight 22 pounds) pulling insect nets during August and September.

While the engines are excellent powerhouses, the electronic-ignition module seems to be the weak link. Two of the four ignition modules (three engines and one spare) had to be returned for repair under one-year warranty. 3W designed a very powerful engine, but more work needs to be focused on their ignition module.

DR. ELSON SHIELDS
Ithaca, NY

NEW TO COMPUTER RADIOS

Don, I am rather new to R/C and have just bought a new computer radio. Your *Model Airplane News* article, "Sailplane Radios" (April 1998), was great. This was my first issue of the magazine. I would love to have part 1 of this article. How I can get part 1 or the complete article on "Effective Programming." [email]

WILLIAM SMITH

Thanks for your note. Actually, "Effective Programming" is a series of columns started in June of 1997 that appear every other month; the one you read was the eighth in the series. To get back issues of Model Airplane News, *call (800) 827-0323.*

To get the complete story, you may wish to buy a copy of my 180-page "Guide to Computer R/C Systems." A lot of the material I use in the "Effective Programming" column was originally discussed in this book. For further information, please refer to my Web page: <http://www.flash.net/~dynamic3/>.

DON EDBERG

BURNING PRETZELS IN THE SKY?

I just had to show you this photo sent to me by Jerry Smartt. These are actually the three winners of a Speed 400 competition in Germany. The pretzels are the trophies! Imagine the beer steins that go with these! LM

TIMING IS EVERYTHING

I've heard that glow plugs differ with respect to how they perform, but I can't see any difference. Is this just marketing hype, or are some plugs of better quality than others?[email]

TONY KOWALSKI

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Every one of our kits and ARF's is designed for fun. We make the toughest, most durable, most precise airplanes on the market. I've been flying since I was 9 months old and I'll keep flying forever. We use CNC router & laser cuts to make the parts super precise. Building them is almost as fun as flying them!

Everywhere I go, there are a lot of happy campers out there flying my Lanier airplanes for this simple reason: We design the best-flying fun you can have!

--Bubba

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For more information, contact us by fax at 770-532-2163 or send a self addressed, stamped envelope to Lanier RC, P O Box 458, Oakwood, GA 30566.

Fun-Fly 40 ARF

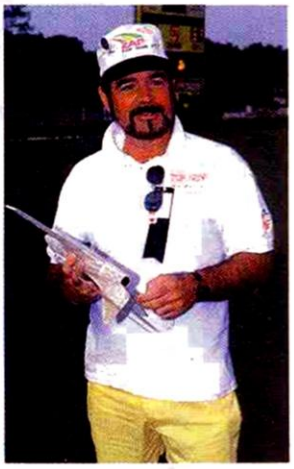
Hawk ARF

Laser ARF

P-51 ARF

Let's leave the issue of quality to others but, yes, there are differences between glow plugs and they seem to be largely misunderstood and/or ignored by most modelers. While I can't discuss all of the differences here, the most important thing to understand about glow plugs is that they come in different heat ranges and that a glow plug's heat range determines its suitability for your particular engine. As a general rule, a hot plug will have a finer element than a cold plug. Often, the element of a cold plug will be physically larger and thicker than that of a hot plug. Because of this, cold plugs require higher currents to light them for starting.

Glow-plug heat range is important because it affects the timing of ignition in a typical glow engine. In an automobile engine, you have either an electronic ignition or a distributor that determines when a spark is released to ignite the fuel. No such mechanism exists in a glow engine. As the fuel is compressed during the compression stroke, many things determine when ignition will take place, not the least of which is the glow plug. So, when assessing whether a plug is good for your engine, keep in mind that timing is what is important. LM



WANTS JETEX MOTORS

I have a Jetex-powered model that I would like to build and fly. I have been unable to locate any Jetex motors. I know they still exist because your August issue mentions a Jetex scale event. Would you please send me the address for the Jetex company?

STEVE VILICICH
Manila, Philippines

The Jetex scale event was held in conjunction with Top Gun and was a lot of fun. There are two places that I'm aware of that sell Jetex motors and accessories: Peck-Polymers, P.O. Box 710399, Santee, CA 92072-0399; (619) 448-1818; and Davis Model Products, P.O. Box 141, Milford, CT 06460; (203) 877-1670.

Pilot PROJECTS

A LOOK AT WHAT OUR READERS ARE DOING

SEND IN YOUR SNAPSHOTS

Model Airplane News is your magazine and, as always, we encourage reader participation. In "Pilot Projects," we feature pictures from you—our readers. Both color slides and color prints are acceptable. We receive so many photographs that we are unable to return them.

All photos used in this section will be eligible for a grand prize of $500, to be awarded at the end of 1998. The winner will be chosen from all entries published, so get a photo or two, plus a brief description, and send them in!

Send those pictures to: Pilot Projects, Model Airplane News, 100 East Ridge, Ridgefield, CT 06877-4606, USA.

BIG-SCALE AEROBAT

Sixteen-year-old Jermaine Hale of Lexington, KY, sent this photo of his latest project—a Carden Giles 202. Covered in Ultracote, the 110-inch-span model uses nine JR 4721 servos for control and is powered by a 3W 140 engine. Jermaine spent six months building the plane.

1913 ETRICH TAUBE

Charles Bobbitt of Madill, OK, writes, "This Balsa USA model was a fun kit to build and is an easy airplane to fly." The plane is covered with Antique Solartex and stained mahogany around the cockpit and engine. It's equipped with a Saito 120 engine, two Wal-Mart 5-inch bicycle training tires, a bomb drop and a homemade machine gun. The Taube is Charles's first big model airplane project. Well done!

AC AUTOGYRO

This electric-powered, direct-control autogyro was designed and built by Les Garber of Duluth, MN. He equipped the model with a 35-inch-diameter rotor, a Rocket 400 motor for power, Mini Olympus 2.33:1 gear reduction and 7-500 Ni-Cd batteries. The 2x15.5-inch rotor blades have a Clark-Y airfoil and are vacuum-bagged foam, glass and carbon fiber. Lester says that flight times are about four minutes, and he has made nearly 100 flights to date.

GREAT P-51

Mark Murdock of Jonesboro, GA, outfitted this .40-size Great Planes Mustang with mechanical retracts and bomb release and dummy external fuel tanks made of balsa and cardboard tube. The model is covered with MonoKote with panel lines drawn on, and Rustoleum Flat Black was used to make it look weathered. Mark adds that with an O.S. Max .46 SF engine with a Slimline muffler in its nose, "The plane flies wonderfully and is very fast."

TABLOID RACER

Tom Hammond of Abbotsford, British Columbia, Canada, sent this photo of his friend, Bill Pottage, and Bill's 30-percent-scale Sopwith, built from Roy Slatter drawings. The 7-foot, 6-inch-span model weighs 24 pounds, is covered with Antique Super Coverite and has wing-warping control. A Quadra 42 turning a 20x8 propeller keeps it in the air.

DOUBLE VISION

Charles Evenson of Eveleth, MN, built both airplanes in this photo. He finished the full-size EAA bipe in 1967 and has since flown it for 800 hours; the model is a ¼-scale Balsa USA kit powered by a .91 Magnum 4-stroke. Chuck modified the struts on the full-size plane and plans to modify those on the model later. He writes, "I haven't flown the model yet but hope it flies as well as the original."

SHORT SUNDERLAND

The winner of six international giant-scale contests and the European Scale Waterflying Cup, this flying boat was designed and built by Jan Hermkens of Oss, the Netherlands. The 1/10-scale model has a 138-inch wingspan and weighs 41 pounds, and it uses four O.S. Max .46 2-strokes for power. Jan writes that the Sunderland can take off from land and water (it has removable beach gear for land).

TEXAS T-BOLT

John Soule of Austin, TX, built this Top Flite P-47 because he liked its rugged reputation. The model uses a Super Tigre 75 turning a 13x6 prop for scale-like flight and has Robart retracts and struts, operating flaps and cockpit detail. John molded the landing gear doors out of fiberglass sheeting and dressed the model with MonoKote and matching LustreKote paint.

MODERN FIGHTER TRAINER

Ron Tipler of Wenatchee, WA, built this SF 260 Marchetti using David Goerne plans from *Model Airplane News*. The Marchetti is equipped with an onboard glow system, modified Century Jet retracts and is covered with MonoKote. Ron says that with an O.S. 300 twin-cylinder 4-stroke in its nose, the 23½-pound model "flies like a dream."

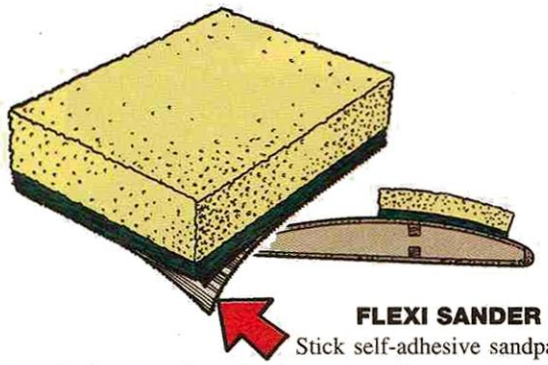
HIGH-ALTITUDE INTERCEPTOR

Jim Gleason of Carolina, RI, scratch-built this balsa and ply Focke-Wulf TA-152c from enlarged David Andersen plans. The 80-inch-span, 15.5-pound model is covered in ½-ounce glass cloth and features homemade mechanical retracts and molded exhaust stacks. Power is a soft-mounted YS 140 engine. Jim writes, "The inner doors and flaps look great on final approach to landing."

Hints & KINKS

by JIM NEWMAN

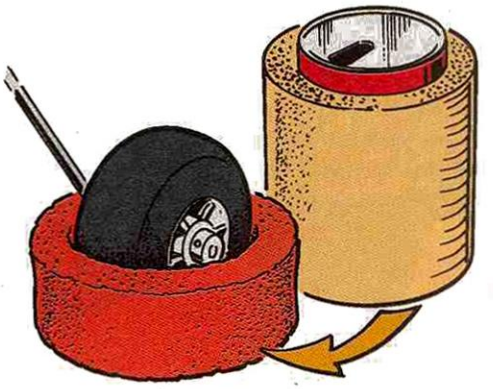
Model Airplane News will give a free one-year subscription (or one-year renewal, if you already subscribe) for each idea used in "Hints & Kinks." Send a rough sketch to Jim Newman c/o Model Airplane News, 100 East Ridge, Ridgefield, CT 06877-4606. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we can't acknowledge each one, nor can we return unused material.



FLEXI SANDER

Stick self-adhesive sandpaper to the bottom of an abrasive pot-scrubber sponge. The sponge will conform to the curve of the wing, etc., so you won't have any flat spots. This is great for light final sanding.

Jack Dundas, Ridgeville, Ontario, Canada



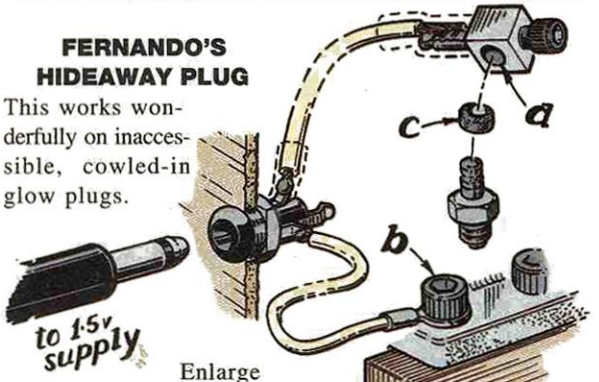
DONUT CHOCKS

Cut deep rings off foam rubber beverage-can insulators, then fit them around your model's wheels while you transport the models to the field. Don says the rubber won't slide on any surface.

Don Stenger, Flower Mound, TX

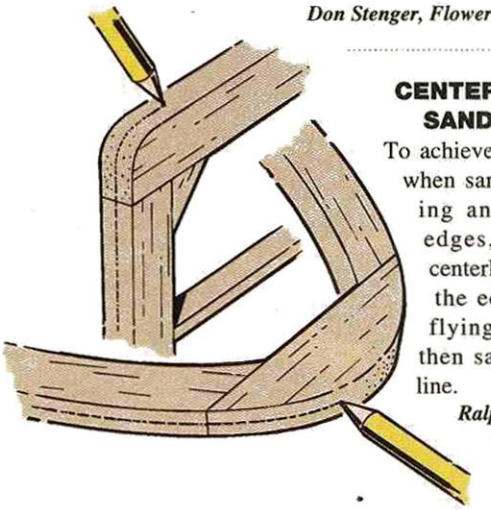
FERNANDO'S HIDEAWAY PLUG

This works wonderfully on inaccessible, cowled-in glow plugs.



Enlarge the pushrod connector hole (a) to fit the glow-plug post, then solder a lead from the pin to a phono jack socket on the side of the model. Connect the other side of the socket to one of your engine mount bolts (b), then use silicone rubber fuel line as an insulator (c) before clamping the connector to the plug. Cover all solder joints with shrink tubing, shown dotted. To light the glow plug, plug in a 1.5V supply from your flight box or Ni-Cd. This system also keeps your fingers away from the propeller.

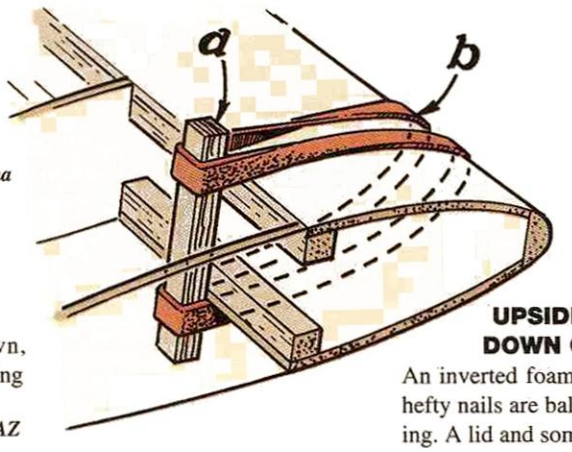
Fernando Vassallo, La Plata, Argentina



CENTERLINE SANDING

To achieve symmetry when sanding leading and trailing edges, draw a centerline around the edge of the flying surfaces, then sand to that line.

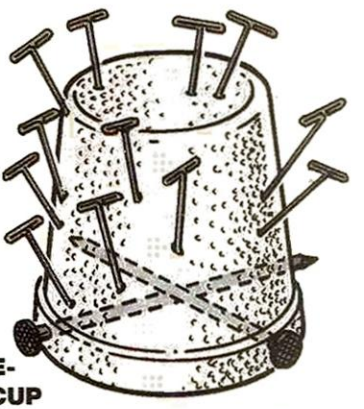
Ralph Brehmer, Cape Coral, FL



BAND BOY

A collection of short dowels, balsa sticks or pencils (a) and rubber bands (b), used as shown, nicely hold the leading edge sheeting in place while the glue dries.

Phil Rowan, Peoria, AZ



UPSIDE-DOWN CUP

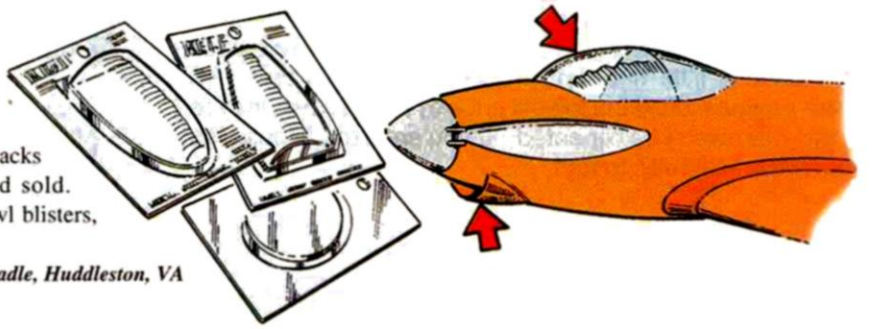
An inverted foam cup is a great pin cushion. The hefty nails are ballast to prevent the cup from sliding. A lid and some sand will work, too!

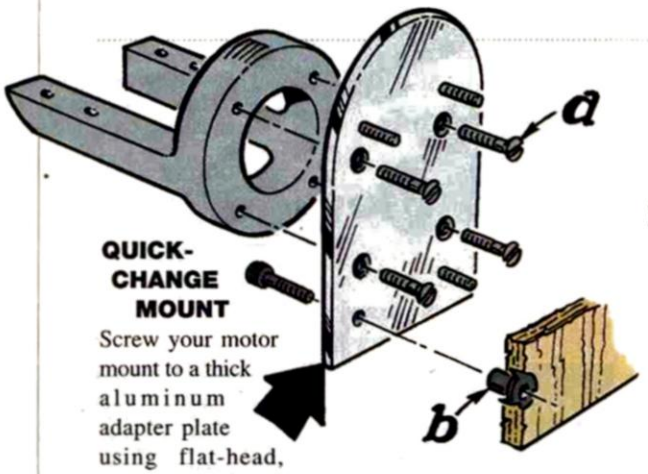
Charles Elbert, Joplin, MO

COLLECTIBLE COWLS AND CANOPIES

Save a few of the various plastic blister packs in which merchandise is displayed and sold. Trimmed to fit, they can be canopies, cowl blisters, air scoops, inspection windows, etc.

Joe Radle, Huddleston, VA

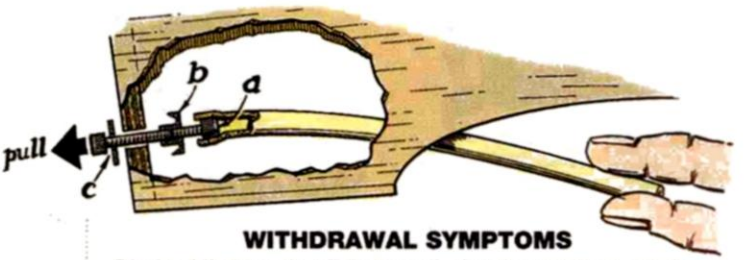




QUICK-CHANGE MOUNT

Screw your motor mount to a thick aluminum adapter plate using flat-head, countersunk screws (a), then attach the adapter plate to the firewall using blind nuts (b). To change engine mounts, just make a new adapter plate. There's no need to re-drill the firewall and install new nuts. The plate can be square or fancy, as drawn.

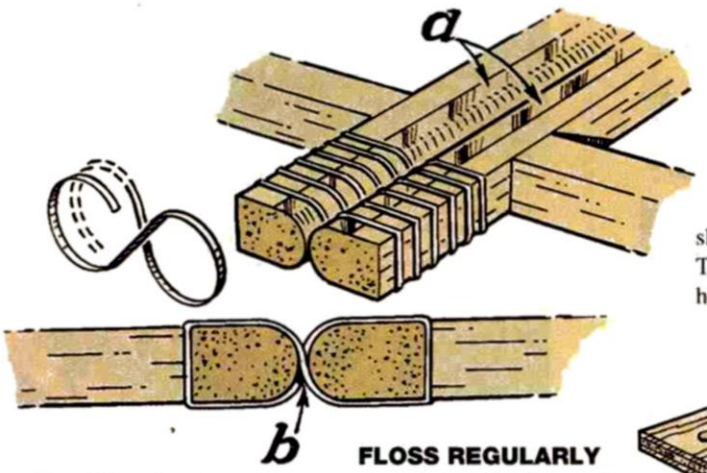
Morris Cunningham, Greer, SC



WITHDRAWAL SYMPTOMS

Placing blind nuts in ARFs (or replacing the nuts in an existing model) is relatively easy if done this way. Insert a screw (a) partway into the back of the blind nut (b), then force stiff rubber tubing onto the head of the screw. Using the tubing, maneuver the nut into the hole in the firewall, then carefully insert a screw and washer (c) into the nut from the forward side of the firewall. Pull the blind nut forward until the spikes of the nut dig into the ply, then remove the tube and screw (a). Continue tightening the screw (c) to pull the blind nut into its seating, then secure it with a smear of epoxy, keeping the glue out of the threads.

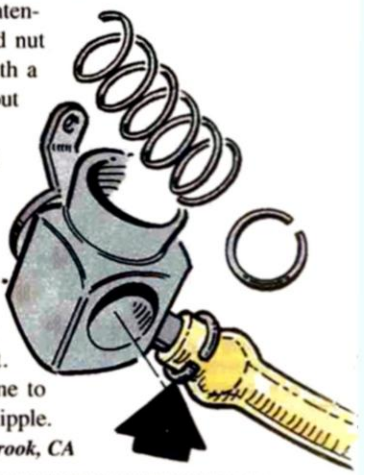
Don Madison, San Diego, CA



FLOSS REGULARLY

Dental floss is extremely strong, so use it to make these rolling figure-8 hinges. Cover the edge of the frame with your favorite material (a), then use a needle to pass the floss around and between the frame edges (b). Glue the floss to the wood with thin CA, then finish covering. These freely moving hinges were used by old-timers. Rescue a modern model with a sewn hinge where a nylon one has fractured. Slice out the broken ends, then sew through the wood. Now you won't have to slice the elevator off and butcher out the broken hinge halves.

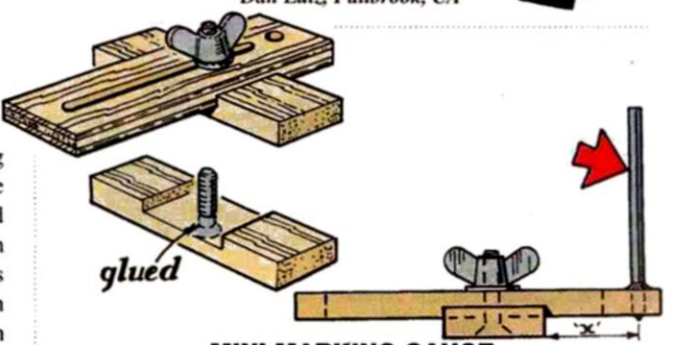
R. Jerome Parker, Hillsborough, NC



SPRING HAS SPRUNG

Cut rings off a suitable diameter spring, smooth the sharp edges and twist them flat. Then slide them over the fuel line to hold the tubing on the carburetor nipple.

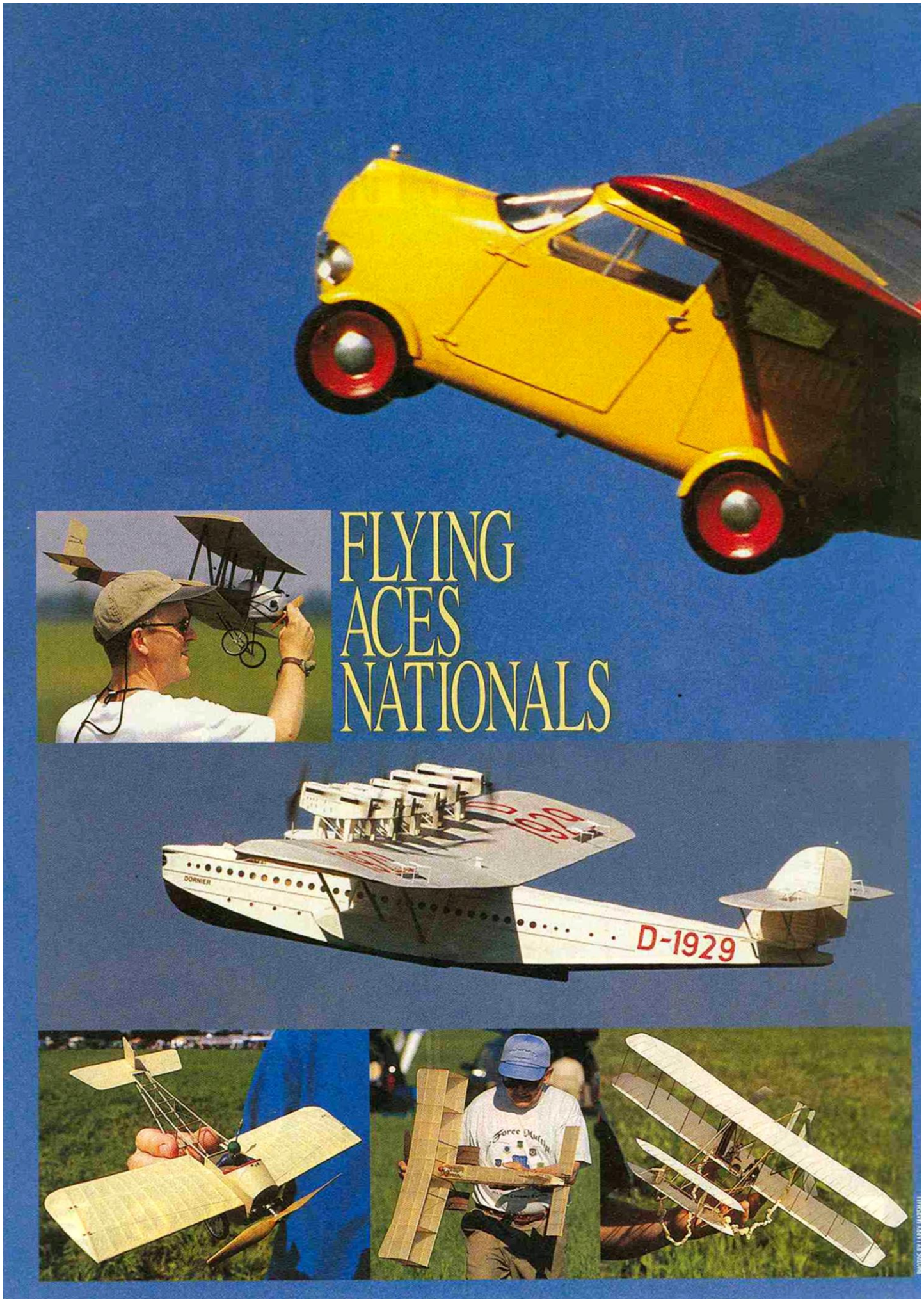
Dan Lutz, Fallbrook, CA



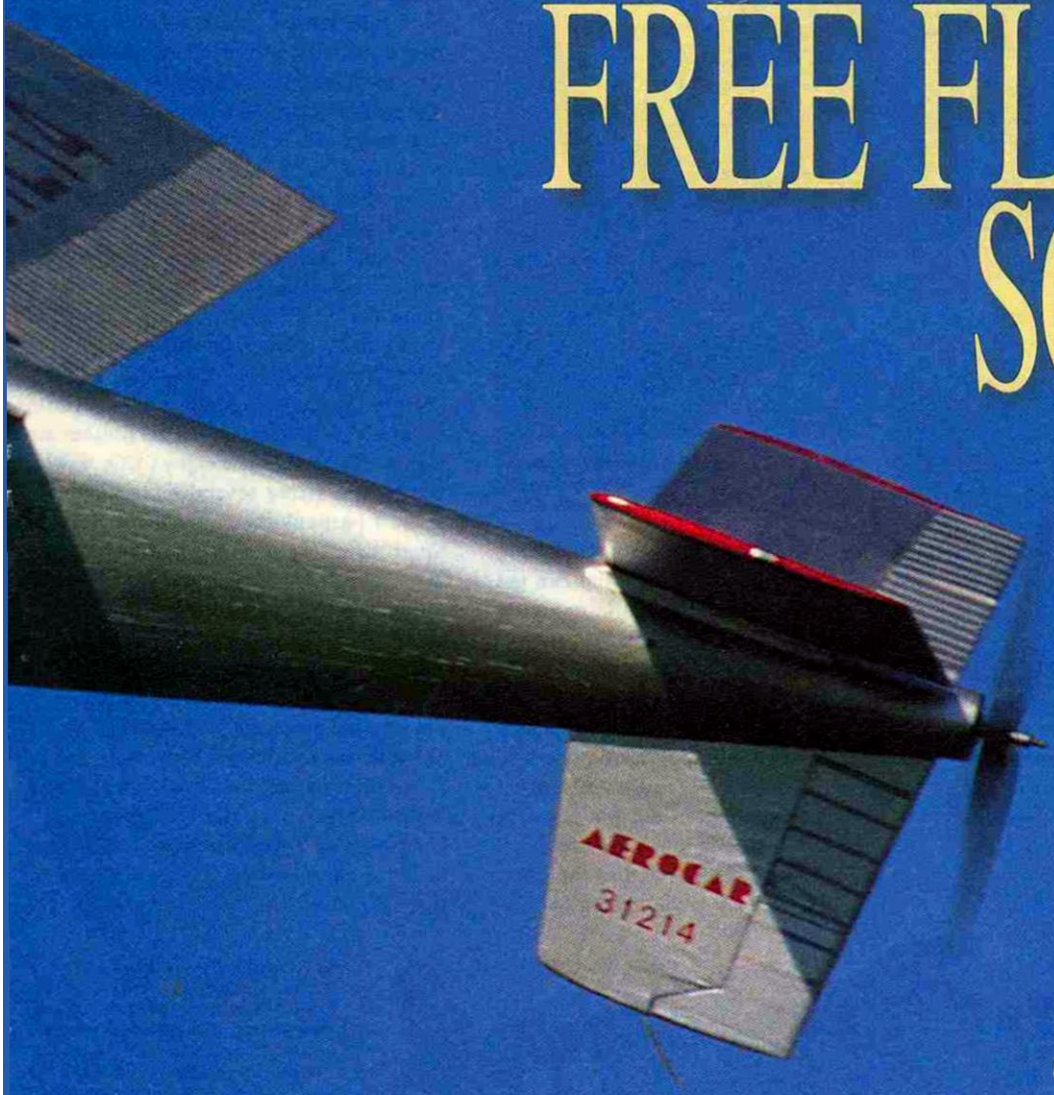
MINI MARKING GAUGE

This would be the ideal tool to use with the "Centerline Sanding" hint. The glued-in ballpoint refill (arrowed) neatly marks a line according to distance "X" set on the gauge and is only about 3 inches long and made of scrap ply, basswood, etc.

Jay Wallace, Ashland, OR


FLYING
ACES
NATIONALS
DORNIER
D-1929

The Best Of FREE FLIGHT SCALE



by LARRY MARSHALL

IMAGINE A MEET at which several hundred scale airplanes are all on the flying field at the same time. Imagine, also, that you can fly whenever you want. Imagine intense competition going on while people are laughing, giggling, and poking fun at one another. If you put all those visions together, you might get close to an image of what occurs at the Flying Aces Nationals held in Geneseo, NY.

Many things set the FAC Nats apart from other meets. First, because it is mostly free-flight scale, there is no radio impound and no restriction on the number of planes that can be in the air at one time. Thus, the number of flights made during the weekend is staggering. There were 1,426 official flights during the weekend, but this does not include the hundreds of practice flights that took place. Maybe more important for the spectators are the rules that give bonus points for multi-engine, multi-wing, floats, canards, etc. The result is the widest variety of scale airplanes you're likely to see anywhere on the planet. Where else can you see Farman transport planes, an Autocar, a Dornier DoX, a Pond Racer, an Avro 547 airliner, a Wright Flyer and a Tilbury Flash intermixed with just about every warbird ever built?

Another thing that causes the wide diversity is the number of events. Pilots don't compete in a single scale event at this meet; there are 25 or so events, most of them scale. There are several events for WW I aircraft, several for WW II, and many others covering Thompson Trophy and Greve race planes, pioneer (prior to WW I) aircraft and many other civilian-aircraft classes. Each requires the use of a different model aircraft.

Main image: Joe Barrish's electric-powered Autocar drew a lot of attention. And yes, it is scale. Opposite: top—Terry Pittman is about to launch his CO_2-powered Farman Junior; center—Don Srull's Dornier DoX's flight is as majestic as its looks; bottom from left to right—this pistachio-scale Bleriot is powered by a Gasparin G24; Don Srull's biplane-canard floatplane is an example of the diversity of scale subjects found at FAC meets; Jack Kacien's 21-inch-wingspan Wright Flyer is an incredible flying model.

Vance Gilbert likes passenger planes. Above is his Avro 547, while, at left, Vance is working on his Marchetti 573.

Some events are timed, with the goal of gaining a 2-minute flight, three times. But others—specifically the race and warbird events—are done in mass-launch fashion. These are a delight on the eyes, and the participants have a ball, as it's an opportunity for competitors to cluster together, knowing that it is their aircraft that they must "trust" to do the winning, and generally, there is considerable banter between competitors in the form of good-natured ribbing. Because of the large number of entrants, several groups fly for most events, and the qualifying winners move on to the next round. For instance, there were 45 entrants in the WW II event. It was neat to see Wildcats, Hellcats, Zeros, Tonys and other fighter planes circling overhead en masse.

Judging for scale accuracy and craftsmanship is also a part of the FAC Nats, and the photos of the planes attest that attention to detailing these models is not compromised by the desire that they fly well. Panel lines, rigging wires and superb markings are all part of the equation; to this, add the fact that these airplanes are released with only the builder's skill at trimming to guide them.

This year, the weather was magnificent, with low winds and sunny skies. Even the oppressive heat that typified this July didn't materialize, and there were smiles all around because of it. It was, however, warm enough to make me wish I owned the ice cream concession. One thing about free flight is that you can get your daily exercise while enjoying model aviation, and to a reporter trying to cover the many flights, the Geneseo field was mighty big. I also think the FAC'ers liked to see me run, as it seemed that every time I was on one side of the field, something really neat started to happen on the other side! But I was in heaven and didn't want to miss any of it, so off I went, bounding across the grass like a ... well, kinda like an old elephant, but I got there, ultimately.

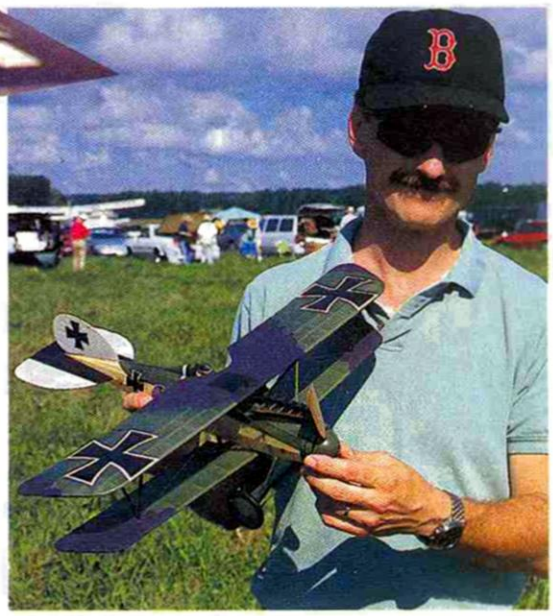
Left: Mike Burns brought this Diels Engineering* Hellcat down from Canada. Below: Chris Parent built this Albatros DV from a Golden Age Reproductions kit. Opposite: Chris super-detailed this F4B-4 using a Golden Age Reproductions kit as a start point.

Don Srull was there with his arsenal of gorgeous aircraft. His Dornier DoX, with its 12 props and electric power, is simply one of the most stately aircraft I've ever seen fly. His Santos-Dumont canard is another of my favorites, as it just looks as if it shouldn't fly, and yet it flies very well and is very stable.

Vance Gilbert was there in all his glory. To meet Vance is to love him. He's full of life, doesn't take himself or his airplanes too seriously and is always able to make the folks around him smile. Vance has a preference for old passenger planes, and he builds some really nice, little-known airliners. In his air force is a Cant, a tri-motor on floats. He also flies an Avro 547 triplane and a Marchetti 573, which is also a tri-motor. Any of these planes would be a challenge as an R/C model and yet Vance makes it look easy, flying them as free-flight rubber models.

It's said that we have no "new blood" in our hobby, that younger people aren't interested. Well, if you ever have a chance to attend the FAC Nats, you'll see a bunch of young folks doing magnificent modeling work. Tom Hallman's Mitsubishi 1MF1 (first in Golden Age Military) is a sight to behold. Tom is an artist, and his finishes are superb. Terry Pittman enjoys CO_2 power, and he was flying several interesting subjects. I particularly enjoyed his Farman Sport, which he powered with a Gasparin 300. But you just have to admire a guy who builds a peanut-scale Bleriot and flies it with a Gasparin 24T. This plane flew really well, and yet it had the dimensions of a large dragonfly. Chris Starleaf continues to produce super models, and his Pond Racer (13-inch span) was particularly neat.

Another of the young guys was Chris Parent. Chris is a master builder and flyer. His Nakajima Type 91 was built from Nate Sturman plans, and he managed a second-place finish in the Golden Age Military



FLYING ACES NATIONALS WINNERS

FAC Scale Peanut (28 entries)

1	Jim Miller	DH-6
2	Steve Griebling	Martinsyde F4 Buzzard
3	Chris Starleaf	Kawasaki Fighter

FAC Power Scale—single engine (18 entries)

1	Allan Schanzle	Rearwin Skyranger
2	Joe Barrish	Aerocar
3	Pat Daily	Albatros DIII

FAC Power Scale—multi-engine (5 entries)

1	Don Srull	Dornier DoX
2	Terry Pittman	Farman Jabiru
3	Jack Noll	DH-8

Shell Speed Dash (57 entries)

1	Gene Smith	Jack Rabbit
2	Al Lawton	Mr. Smoothie
3	Jack McGillivray	Cessna CR-3

Modern Civil Production (18 entries)

1	Dave Rees	Citabria
2	Jack McGillivray	Found 100 Centenial
3	Paul Boyanowski	Piper Clipper

Dime Scale (33 entries)

1	Jack McGillivray	Comet Arado
2	Herb Kothe	Farman
3	Stu Weckerly	Stinson 105

Thompson Races (10 entries)

1	Jack McGillivray	Cessna CR3
2	Al Lawton	Hughes Racer
3	Richard Zapf	LTR14

Greve Races (10 entries)

1	Chris Starleaf	Chambermaid
2	Paul Boyanowski	Folkerts SK4
3	Tom Nallen Sr.	Keith Ryder Jack Rabbit

Flying Horde

1	Dave Rees	Citabria
2	George Bredehoft	Not available

High-wing Peanut (26 entries)

1	Tom Hallman	Clipped Wing Cub
2	Dave Rees	Corona Cougar
3	Stu Weckerly	Stout 2AT

NoCal (17 entries)

1	George Bredehoft	Hosler Fury
2	Dan Kane	Schlepp
3	Carol Sandusky	F4F

Pioneer Scale (12 entries)

1	Tom Hallman	Bleriot VII
2	Dave Rees	Plage Court Torpedo 2
3	Tom Nallen II	Short T5

FAC Scale (46 entries)

1	Don Srull	Cant
2	Dave Rees	DH Fox Moth
3	Dave Stott	A.N.E.C.

WW II Mass Launch (45 entries)

1	Greg Gallo	Kawasaki KI-61
2	Gene Smith	Kawasaki KI-61
3	Jack McGillivray	Fairey Barracuda

Powder Puff Scale (3 entries)

1	Marie Rees	Porterfield
2	Juanita Reichel	Clipper
3	M.S. Smith	P-51

Modern Military Mass Launch (13 entries)

1	Richard Zapf	Ryan Fireball
2	Jack Noll	T-28
3	John Houck	Bell XF2L-1

Golden Age Military Mass Launch (14 entries)

1	Tom Hallman	Mitsubishi 1MF1
2	Chris Parent	Nakajima Type 91
3	Stew Meyers	Vultee Attack

Bendix Race (15 entries)

1	Oscar Smith	Lockheed Vega
2	Dave Livesay	Vultee VI-A
3	Steve Griebling	Mr. Mulligan

FAC Giant Scale (11 entries)

1	Tom Nallen II	Secat
2	Bob Bojanowski	Rearwin Speedster
3	Dave Rees	Schweitzer

Golden Age Civilian (32 entries)

1	Jack McGillivray	DH Moth Minor
2	Stu Weckerly	Stout 2AT
3	Dave Rees	Nicholas Beasley

Goodyear Midget Racers (14 entries)

1	Jack Kacian	Whittman Racer
2	Richard Zapf	Lil Gem
3	Chris Starleaf	Pogo

WW I Mass Launch (28 entries)

1	Dave Rees	Martinsyde Buzzard
2	Al Lawton	Fokker DVII
3	Steve Griebling	Martinsyde Buzzard

FAC Jumbo Scale (23 entries)

1	Al Lawton	Spruce Goose
2	Don Srull	P13
3	Don Srull	Short

Fairchild 24 Mass Launch (15 entries)

1	Fred Gregg	
2	Jack Moses	
3	Bob Bojanowski	

Embryo (30 entries)

1	Herb Kothe	Go Devil
2	Bill Passarelli	Sunbird II
3	Chet Bukowski	Chet's Plane

One Design (7 entries)

1	Don Ross	
2	Richard Fiore	
3	Charles Kriete	

Old-Time Commercial Rubber (45 entries)

1	Herb Kothe	Miss Canada
2	George Lewis	Miss Canada
3	Bill Passerelli	F.A. Gull

Old-Time Stick Rubber (17 entries)

1	Jim Anderson	Gollywock
2	Herb Kothe	Korda C
3	Bill Passarelli	Thermolier

Jimmy Allen (15 entries)

1	Stu Weckerly	Bluebird
2	Bill Passarelli	Skokie
3	Herb Kothe	Sky Chief

Electric Old-Time Gas Replica (15 entries)

1	John Houck	Albatros
2	Vic Nippert	Kerswap
3	Dick Miller	Half Pint

The Blue Max

Movie buffs know "The Blue Max" from the film of the same name that starred George Peppard; it's the story of a brash and daring WW I German aviator living on the edge. His goal was to shoot down 16 enemy aircraft to win the coveted Blue Max medal, the highest honor awarded German fighter pilots.

And so it goes in the Flying Aces, though you need not be as good-looking as George Peppard, and you don't need to shoot anyone. But the Flying Aces "keep score" by dispensing "kanones" to winners of FAC events. Once you've won 16 kanones, you are awarded the Blue Max. It's a laid-back way of rewarding those who compete successfully and consistently, and the Flying Aces have many proud owners of the Blue Max.

Hal Lorimer flew this Skokie.

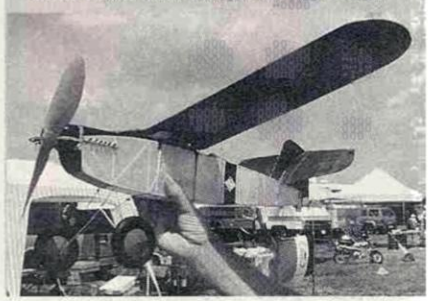
THE GRAND CHAMPION

A grand champion is crowned every year, based on the cumulative success in the many events. This rewards not only craftsmanship and flying abilities but also consistency, in that to win, one must build several aircraft for the various events and fly them with sufficient consistency to do well. In addition, there's a dash of persistence and strong will, as to fly in many FAC events during the weekend requires a certain amount of organization and work so that you're ready for your events, and they don't overlap in time.

This year, Dave Rees was crowned Grand Champion. According to my unofficial tally, Dave took three first-place, three second-place and two third-place awards during the meet. He also placed well in several other events. Now, that's a lot of flying, and each of Dave's planes is a masterpiece. His Plage-Court Torpedo graces our cover.

Dave and his wife, Marie (first place in the Powder Puff event), operate HiLine Inc., one of the important suppliers of electric motors for small free flight and R/C models. He's also a superb model designer who has won numerous contests elsewhere. Most of all, Dave and Marie are really nice folks; if you have a chance, get to know them.

Dave Seath flew this beautiful example of the Bluebird. Both Dave and Hal came down from Ontario for the event.



This J1 was modified by Hamilton Propellers to haul propellers around the country. Dave Stott put a lot of work into detailing the model.

event. He also brought an Albatros DV and F4B, both built from Golden Age Reproductions* kits, and both were museum-quality models.

There were electric-powered models, too. Both scale and non-scale events were held for small electric motors. For me, the highlights were Joe Barrish's Autocar, powered by a HiLine dual Mini-6, Dave Rees's American Eaglerock (also powered by a HiLine system) and Terry Pittman's Farman Jabiru (powered by four HiLine Micro-4s). But there were electric free-flight planes everywhere; they've really come of age.

It's no wonder that more and more scale guys are becoming interested in free-flight scale. The planes are relatively simple to construct and require far less space to build and store, and the cost of production is almost nothing. They can be flown in small areas with short motor runs or in large fields with 15 to 20 of them in the air at once. Give this form of model aviation a try; it's fun. At the end of the event, Vance Gilbert said, "Only 362 days until the next one." Maybe we'll see you there.

**Addresses are listed alphabetically in the Index of Manufacturers on page 150.*

Air Adventures of JIMMY ALLEN

Dave's American Eaglerock is powered by a Mini-6 electric motor from HiLine Inc.

Long before Barney and Beanie Babies, there were marketing guys who realized that the best way to parents' wallets was through their kids. The 1930s was a time when aviation was used the way sports heroes are today: as an advertising vehicle. The Jimmy Allen Flying Club was founded by Skelly Oil as a gimmick to get parents to buy their gasoline. It was a spinoff of a radio program, also sponsored by Skelly Oil, called "The Air Adventures of Jimmie Allen." Jimmy, the hero, was every boy's dream in the '30s; a teenager who was learning to fly.

The sales gimmick amounted to a program by which kids convinced their parents to buy Skelly gas, and the kids, in return, ultimately got Jimmie Allen airplanes to build. A series of these sport free-flight models was created and, from a modeling point of view, the planes took on a life of their own as heavily sponsored events brought thousands of young flyers together for model airplane contests.

There has been a rebirth of interest in flying these planes because they fly well and are fairly easy to build. One such event took place at the FAC Nats this year. There were 15 entries, and it was good to see some of these old birds fly.

Here, Dave poses with his Martinsyde Elephant.

Holiday Wish List

Make copies of the following pages. Pass them out to family members. Get the presents you *want*, for once!

by THE STAFF OF MODEL AIRPLANE NEWS

Scale Bristol F2B fighter

3 Sea Bees has made a name for itself by building high-quality ARF kits of vintage aircraft. The Bristol F2B 1917 fighter is its eighth and latest 1/5-scale stand-off-scale replica kit, and it takes only eight to 10 hours to complete.

This 16-pound, 94-inch-wingspan biplane comes nearly completely built and includes all the necessary hardware, a rear gunner's scarf ring and a Lewis machine gun! It's covered with Solartex and requires a .60 to .90 2-stroke or .90 to 1.20 4-stroke and can handle gas engines. Removable wings allow easy transportation. At $925, it's 3 Sea Bees' most expensive kit yet, but, boy, would it light up that loved one's holidays!

Contact 3 Sea Bees Models, P.O. Box 747, Lake Stevens, WA 98258; (425) 334-6089; fax (425) 397-2126.

Top Gun-quality Aerotech scale P-47D

Here's a gift for the serious scale modeler who would like a world-class kit that does not require hundreds of hours of building time. Aerotech Models' new 1/6-scale P-47D Thunderbolt is a completely premolded carbon-fiber kit (rivets, screws and panel lines are molded in), and it has precut and prehinged Fowler flaps, ailerons and elevator surfaces. Weighing 28 pounds, the 82-inch-wingspan aircraft was designed for a Brison 4.2 or G62 engine. It comes with a complete hardware package, a 2.5-hour video guide and written instructions. Priced at $2,895, including shipping and handling, it has an estimated building time of 60 hours.

For further information, contact Aerotech Models, 2640 Minnehah Ave., Minneapolis, MN 55406; (612) 721-1285; website: http:\\wavetech.net\~aerotech.

"C" Series radial from Technopower

To some, this may look like the Christmas wreath on RoboCop's house, but to modelers, it's the glorious Technopower 9-cylinder, 4-stroke radial. What a beauty! It has 18 poppet valves, true master-rod full-scale design, phosphor-bronze valve guides and cam-follower bushings, and chrome cylinder bores, so he'll know you'd marry him all over again when he finds this one under the tree.

Technopower II Inc., 610 North St., Chagrin Falls, OH 44022; (440) 564-9787; website: www.technopower.com.

Norvel BigMiG .061 with R/C Herr Engineering Star Cruiser

Here's an exceptional 1/2A engine with throttle that has earned a fantastic reputation for performance and reliability. At $39.99 and with a weight of just over 1.77 ounces, the BigMig .061 delivers a ton of flying fun for the money and powers all the new 1/2A kits, such as the Herr Engineering Corp. Star Cruiser shown nearby (a great combo for small-plane enthusiasts and newcomers on a budget). Contact Norvel, 2244 E. Enterprise Pkwy., Twinsburg, OH 44087; (800) 665-5975; fax (330) 425-3935, website: www.norvel.com.

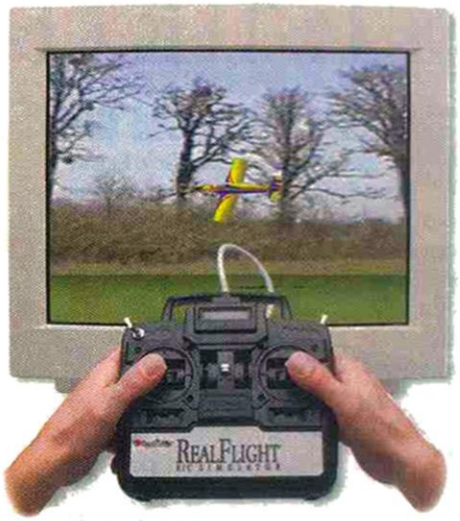
For more on the $54.95 Herr Star Cruiser, which sports a wingspan of 42 inches and displays gentle flight characteristics: Herr Engineering, 1431 Chaffee Dr., Ste. 3, Titusville, FL, 32780; (407) 264-2488; fax (407) 264-4230.

Bob Violett Models MiG 15 JET

Here's a 1950s-era fighter with great ground handling and superb in-flight stability. Perfectly suited to first-time ducted-fan enthusiasts and experienced "jet jocks" ready for turbine power, the BVM MiG 15 features a generous wing area, a fat airfoil, long tail moment, ample inlet area and a wide-stance landing gear (Oleo action) with scale struts and wheels. Computer-designed, with laser-cut parts, this MiG 15, like other BVM products, was designed to be easy to build. The distinctive high tail and swept outline of this 68x68-inch jet also make it easy to see. The plane features finished epoxy/glass, a panel-line detailed fuselage, and prefabricated fin, hatches and duct work. Match this with a RAM turbine engine, for which Bob Violett Models is now the primary sales and service dealership in the U.S., and you have an awesome holiday gift that will deliver reliable, outstanding flight performance. BVM has a new four-color brochure that tells the complete MiG story. For a free copy, send a 9x11-inch SASE with 55¢ postage to BVM, 170 State Rd. 419, Winter Springs, FL 32708, call (407) 327-6333, fax (407) 327-5020, or visit www.bvmjets.com on the Web!

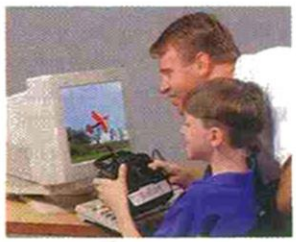
Fuel pump of the future

The model engine enthusiast needs to pump fuel, and fueling systems keep getting better. The Slimline SL-2000 features an "oversize" motor for ultimate reliability, tight "O-ring" seals, an anti-siphon design, materials that will not contaminate fuel, the ability to thread onto any 1-gallon fuel bottle and a simple, durable design, and it comes in several colors—all for $49.95. For more info, contact Slimline Mfg., P.O. Box 3295, Scottsdale, AZ 85271-3295; (602) 967-5053; fax (602) 967-5030



Fly R/C all winter long

Does your husband/boyfriend stare out the window in February hoping that blizzard will give way to an early spring thaw? Get him a RealFlight R/C Simulator, and he'll be able to fly R/C all year long. It's simply the most authentic R/C flight simulator out there, and it can be purchased with a genuine Futaba transmitter that plugs into the game port of your PC. Whether he's a scale, glider, aerobatic, or fun-fly pilot, RealFlight will take him there.



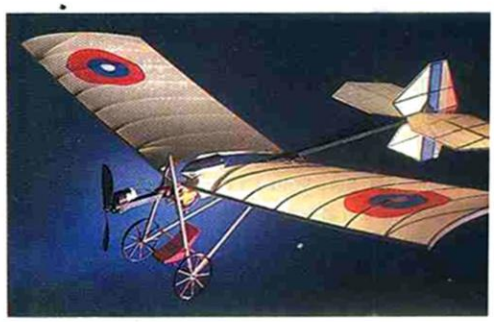
Great Planes Model Distributors, 2904 Research Rd., Champaign, IL 61826-9021; (217) 398-6300; fax (217) 398-1104; website: www.greatplanes.com.

Airtronics Stylus Programmable Radio

This 8-channel, easy-to-use, world-class programmable radio comes with special customized programs for fixed-wing aircraft, helicopters and sailplanes. A unique memory-card system lets you add performance features for any type of aircraft, or store up to 50 additional model setups—the performance of more expensive systems at a cost of only $535. Its menu system was designed for simplicity of use, and it is said to have the fastest PCM response time.

For more information, contact your local hobby shop, or Airtronics Inc., 1185 Stanford Ct., Anaheim, CA 92805; (714) 978-1895; fax (714) 978-1540.

Hobby Lobby Demoiselle



Nothing is more reminiscent of holidays the way they used to be—the way they should be—than an antique model airplane. Hobby Lobby's Demoiselle Slow Flyer offers the best of both worlds. It combines the nostalgia of yesteryear with the reliable technology of today's R/C radio equipment. The fabric-covered Demoiselle Slow Flyer electric is not only almost ready to fly, but with a cruise speed of only 4mph, it can also fly in very small areas! You can reenact the movie "Those Magnificent Men in Their Flying Machines" around the Christmas tree! It will land and *stop* on a card table, and it turns around in less than 10 feet of airspace.

Hobby Lobby Intl., 5614 Franklin Pike Cir., Brentwood, TN 37027; (615) 373-1444; fax (615) 377-6948; website: www.hobby-lobby.com.

Wish List

The Practical Gift

The Hobbico Accu-Cycle Plus is definitely one of the coolest chargers to come along in a while. Like other chargers, it's a quick peak-detection charger that's ideal for peaking 4- and 5-cell RX Ni-Cd packs, 6- or 7-cell

flight packs and 8-cell TX Ni-Cd packs in about 45 minutes. Unlike other chargers, however, it has two sets of independent circuitry, so you can charge/discharge/cycle a single pack or two packs at once at different charge/discharge rates. That's very cool! With the DC Field Converter (not shown) the Accu-Cycle Plus also has "use it anywhere convenience," so it's fully operational at the field.

Great Planes Model Distributors, 2904 Research Rd., P.O. Box 9021, Champaign, IL 61826-9021; (217) 398-6300; fax (217) 398-1104; website: www.greatplanes.com.

New EPP Floater with Hitec radio

For the newcomer who has an interest in sailplanes, here's Trick R/C's rugged trainer for thermal and slope flying that takes only five hours to build! The all-EPP foam New Floater was designed for beginner builders and flyers. Made from nearly indestructible, strong, lightweight, combat-proven EPP foam, the Floater costs $70. You can also order a Combo kit that includes a Hitec Focus III radio and two servos for $140, complete! The kit has a wingspan of 72 inches, a wing area of 552 square inches, an E205 modified airfoil, an 8 ounce wing loading and a weight of 31 ounces. The Focus III is a single-stick, 3-channel radio with mixing—sounds like holiday fun! Contact Trick R/C, 938 Victoria Ave., Venice, CA 90291; phone/fax (310) 301-1614; website: www.zagi.com .

Zap Gift Pack

Here's a holiday gift of universal modeler appeal; just choose your selection from the large variety of Pacer Zap adhesives (a variety of types in various viscosities) and related products, such as glue accelerator and thread-locking compound, wrap them up in a gift package for that special modeler, and you'll see a lasting smile. Ask for help from your local hobby shop or contact Frank Tiano Enterprises, 15300 Estancia Ln., W. Palm Beach, FL 33414; (407) 795-6600.

High Point Precision Balancer

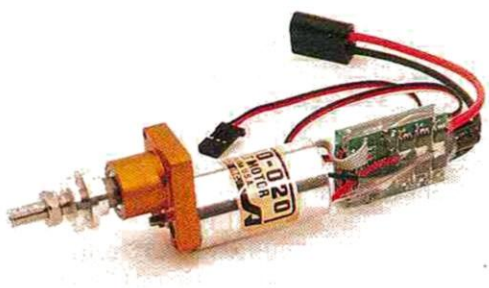
There's a wide variety of prop balancers in the world, and here's one any modeler would be proud to own—one that can be adjusted to balance propellers, ducted-fan rotors, airplane spinners, heli rotorheads, clutch bells and many more such items. At $32.95, this very useful tool will give your special friend many years of good use.

Look for it at your local hobby shop or contact Robart Mfg., P.O. Box 1247, 625 N. 12th St., St. Charles, IL 60174; (630) 584-7616; fax (630) 584-3712.

New Futaba 8UAPS PCM 1024

For the sophisticated modeler who needs programming power, this 8-channel computerized radio has an 8-model memory that may be expanded to store eight additional models with the use of a "campac" card. The radio features electronic trims with seven programmable mixes, five of which offer "5-point" curves. Is your modeler friend into helicopters? There are two transmitter versions—one for airplanes and sailplanes, and one for helis. The dedicated heli version features an all-new CCPM mixing with special gyro and governor mixes.

For more information and price, contact your local hobby shop, or Futaba Corp. of America, P.O. Box 19767, Irvine, CA 92723-9767; (714) 455-9888; fax (714) 455-9899.



AstroFlight 020 brushless motor

A gem of a small power system for the electric modeler. The AstroFlight brushless 020 motor, shown here with an Astro Super Gearbox (it also comes direct drive and with a planetary gearbox), is that special gift for the loved one who likes ½A-size airplanes or small electrics (Speed 400 size). This high-quality motor with direct drive can power a high-speed racer or, with gearbox, a scale miniature or thermal floater. Maintenance-free, quiet, clean and high-tech—what a gift! The unit shown spins an 11x8 Cam prop at 5,000rpm, drawing only 13.4 amps using a 7.5V battery. At 3.6 ounces, this unit costs $240. Contact your local hobby shop or AstroFlight, 13311 Beach Ave., Marina del Rey, CA 90292; (310) 821-6242; website: www.astroflight.com.

Wish List

A P-47D ARF for that special modeler?

Is your special modeling friend particularly busy? This new ARF P-47D from Global can be built and finished with custom scale markings in a very short time. It includes parts bagged according to assembly sequence, precut retract wheel wells, instructions detailing all assembly steps, and even a pull-string "snake" line to help you route the aileron servo lead through the wing. Twenty hours to build a "real close" scale model with personalized finishing could be your modeler's dream!

Ask your local hobby dealer about it, or order toll-free from Global Hobby Distributors, 18480 Bandilier Cir., Fountain Valley, CA 92728-8610; (800) 854-8471; (714) 963-0133; fax (714) 962-6452.

Hangar 9's Cessna 182 and Advance .40 ARFs

If your loved one's past flying season was fraught with "surprise" landings, one of Hangar 9's Ultra Series VRTF (virtually ready to fly) aircraft might be just the ticket to bring some cheer to his holiday.

If scale is his thing, a highly detailed version of the beloved Cessna 182 is sure to keep "Grumpy" the elf away from your house. Covered with Goldberg Ultracote and finished with matching paint, this .40-size, 66-inch-wingspan model is so detailed that your partner's flying-field friends are sure to think he built it himself.

Maybe your favorite R/C'er is just coming out of training; if that's the case, having the next step in his R/C adventure wrapped in festive paper and decorated with a bow might be just what he wants. Hangar 9's new Advance .40 is ready to take him to the world of snap-rolls, spins and knife-edge flight. The Advance's semisymmetrical airfoil gives it enormous maneuverability at high speeds without sacrificing any of the gentle, slow-speed characteristics of a trainer. The 90-percent-built VRTF Advance .40 will take him to that world *fast*—in about three hours of building time!

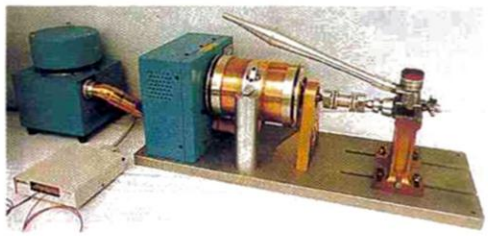
Hangar 9 is distributed exclusively by Horizon Hobby Distributors, 4105 Fieldstone Rd. Champaign, IL 61821; (217) 355-9511.

MiniCraft Fret Saw MB495

With its multi-position blade (four angles), rubber feet and high-quality Minicraft design, this multipurpose saw and included power supply transformer (MB730) would be a fine addition to any modeler's building table. The saw can cut plastics of up to ¼ inch in thickness, non-ferrous metals up to ⅛ inch, ferrous metals up to 1/16 inch, hardwood and plywood up to ½ inch and balsa up to 1⅝ inches. All this for only $157.95. Contact Hobby Hangar, 1862 Petersburg Rd., Hebron, KY 41048; (606) 334-4331.

M.V. Racing Products engine dynamometer

M.V. Racing and Magtrol have teamed up to offer a first-class, highly accurate engine dynamometer for use with gasoline and glow engines. The Magtrol Frictionless ED-715 dyno and DSP 6000 programmable controller can test engines as small as a .12 and as large as a 7hp Zenoah gas guzzler. Up to seven thermocouples can be used to gather temperature data. The $16,249 ED-715 will put a smile on the face of the engine manufacturer who needs to know and the modeler who thinks he has "everything" and demands only the best. Contact M.V. Racing Products, 1 Redondo, Laguna Niguel, CA 92677; (714) 495-9320; website: www.mmvracing.com.



For the modeler who has everything

Perplexed because your R/C'ing significant other seems to have everything? He may have a tachometer, but the question is: does he have the best one? Get him a TNC Electronics tachometer, and he'll have the best there is.

TNC Electronics, 2 Whites Lane, Woodstock, NY 12498; (914) 6790-8549; fax (914) 679-5542.

Take the Shuttle Challenge!

The Shuttle Challenge from Hirobo is a revolutionary tool for learning to fly a helicopter. The aircraft's purpose-built head ensures good control while it prevents the blades from contacting the boom during a hard landing. When in proximity to the ground, the special collapsible undercarriage levels the helicopter and absorbs most of the energy of landing, so beginners can hover 2 feet high with complete confidence. Best of all: the Challenge is based on the Shuttle, so as a student's skill improves, it can be upgraded into an all-out, high-performance Shuttle. This is a gift that will get years and years of use. For more information, contact Altech Marketing, P.O. Box 7182, Edison, NJ 08818-7182; (732) 225-6144; fax (732) 225-0091.

MODEL AIRPLANE NEWS

FIELD & BENCH REVIEW

by PHYLLIS BELL

I WAS VERY excited when I was asked to review the AirVista trainer—a new type of prebuilt trainer from Hobbico*. I had heard about its development several months earlier and was anxious to see how well it went together. The Hobbico ads claim that you need only one evening, two tools (pliers and a Phillips-head screwdriver) and zero experience to build the AirVista trainer. No special tools or adhesives are required.

HOBBICO AIRVISTA

From the bench to the field in no time!

Before starting, I recommend that you watch the video included with the kit. It stresses the need for safety and gives a wonderful overview of the construction process. The video also does a great job of getting you psyched to get out there and start flying!

GETTING STARTED

I had never built a plane before, but I had seen the contents of many of my

husband's kits. On opening the box, I was pleasantly surprised to see how much of the assembly had already been completed. The wings and fuselage were built; the ailerons, rudder and elevator were hinged; and the pushrod tubes were in place. The model was also attractively covered. As I mentioned, the Hobbico ads boast that this kit can be built in one evening, and at this point, I believed this might be possible.

After making sure my radio system was working properly and all of the servos were properly centered, I installed the radio components in the die-cut plywood tray as instructed. It might have been easier to position the servos and drill pilot holes instead of just screwing

SPECIFICATIONS

Model: AirVista

Type: prebuilt trainer

Manufacturer: Hobbico

Wingspan: 62 in.

Wing area: 682 sq. in.

Length: 51 in.

Weight: 5 to 6 lb.

Engine req'd: .40 to .46 2-stroke

Engine used: O.S. .40 LA

Radio req'd: 4-channel with four standard servos

Radio used: JR® X-388S

List price: $194.98

Features: prebuilt trainer that is covered and comes with all control surfaces hinged and pushrod guides and engine mount installed. Features a bolt-on tail group and comes with a video that covers assembly and flying field procedures, a detailed, easily understood manual and a clevis installation tool.

Comments: the AirVista is an innovative prebuilt trainer that you can easily put together in a few hours. The hinged control surfaces, installed engine mount and pushrod guides really help beginners. The included video gives the novice the information necessary to guarantee success.

Hits

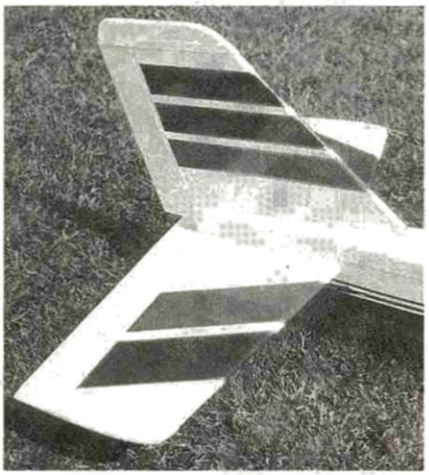
- Simple assembly.
- Informative video.
- Neat clevis installation tool.
- Looks and flies great.
- Detailed, easy-to-follow manual.

Misses

- None.

directly into the wood as per the instructions, though either way gets the job done. I then screwed the completed tray into the fuselage. I found it very convenient to work on the tray before installing it in the fuselage.

With the first steps of radio installation completed, I moved on to the wing assembly. This was amazingly simple; in just a few steps, I installed the torque rod horns and screwed the aileron servo to the prebuilt tray. I then put the wing halves together, lining them up with



The horizontal stabilizer and vertical fin come covered and hinged and slide into each other and the fuselage perfectly aligned.

fiberglass rods inserted in the spars and capturing the aileron servo tray between the wing halves. Next I taped the center seam. Voilà!—a completed wing. (Although my husband, Rick, and I were somewhat concerned about the wing's being only taped together, it held up well at the flying field.) When you install the torque rod horns, be sure to use the plywood gauge.

I moved on to the fuselage by installing the horizontal stabilizer and fin. Two bolts built into the vertical fin pass through the horizontal fin to the bottom of the fuse and are secured with nuts to lock the assembly in place. Alignment was automatic, and no corrections were needed. The next step was to put the fuel-tank parts together and slide the tank into place. When you install the tank, make sure the fuel line is not pinched.

The most challenging step of constructing the AirVista was the pushrod installation. I used the handy clevis tool included with the kit to attach the clevises. This is a great little tool and is available separately. It slips over the clevis and allows it to be easily screwed onto the pushrod. This nifty tool has since become one of Rick's basic tools. The rest of the assembly, which included landing gear, engine and cowl installation, was extremely simple. The engine mount, as expected, was already installed. So far, this was as easy as the AirVista ads proclaim.

FLIGHT PERFORMANCE

We ran a couple of tanks of fuel through the O.S. .40 LA for break-in. With the engine set, we were ready to go.

• *Takeoff and landing*

The AirVista taxies easily and true. Slowly apply throttle and the AirVista is quickly airborne with no fuss.

Landing is just as simple; just throttle back and aim for your touchdown point. The AirVista settles slowly and nicely. On touchdown, a little down-elevator will keep the AirVista planted.

• *Trainer qualities*

As a trainer, the AirVista is hard to beat. It's a very stable learning platform. Half-throttle is the norm for flight; any more, and it will climb (typical of trainers). Slow flight is also very stable and solid.

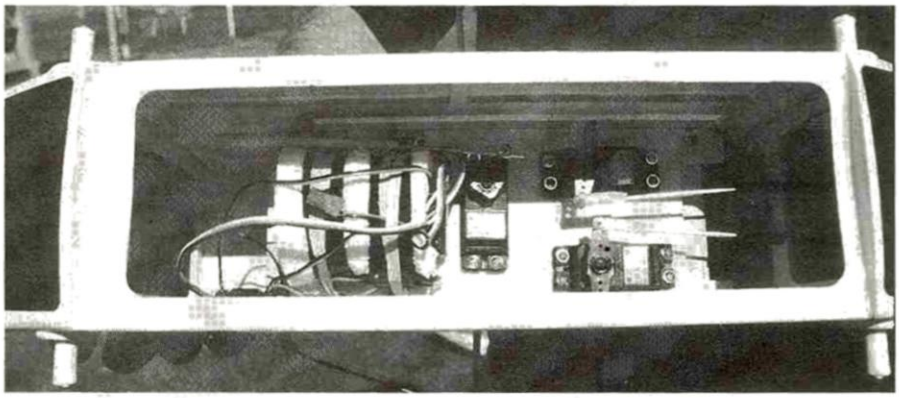
• *Aerobatics*

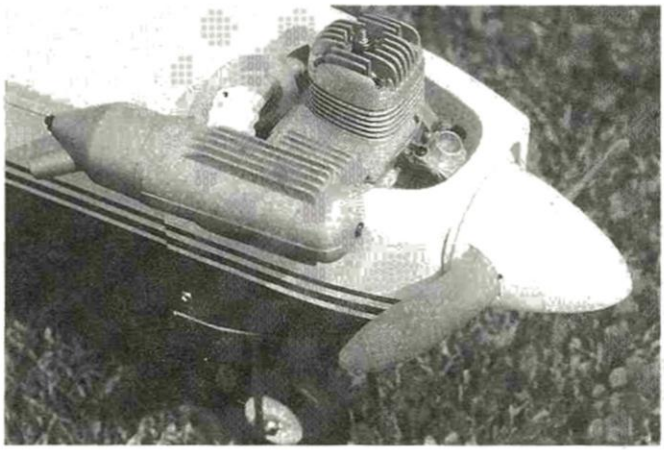
The AirVista is capable of all basic aerobatics, including loops, rolls and Cuban 8s.

FINISHING UP

Rick helped with the final flight setup. This included balancing the plane and checking the aileron, rudder and elevator throws. Details of how to do this are in the instruction manual, which should be followed. Next, it was off to the flying field.

From start to finish, I spent a little over three enjoyable hours putting the AirVista together. I found this experience truly enjoyable. The model's simplified construction, easy-to-follow instructions and included video are great for building a beginner's confidence before heading to the field. The AirVista's easy flight manners make it a winner!





Above: the die-cut plywood servo tray is removeable for easy servo installation. There's plenty of room in the fuselage for the receiver and battery pack. The wing is rubber-banded over the fuselage using the wooden dowels on the right and left of the photo. Left: an O.S. .40 LA is a perfect match for the AirVista. The engine mount comes already bolted to the firewall, making engine installation a snap.

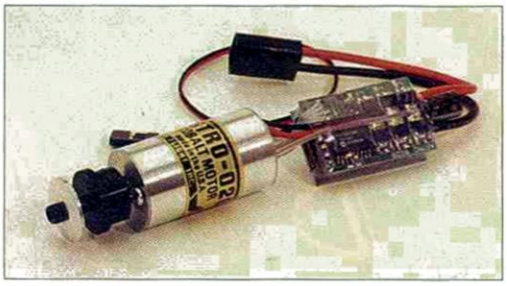
**Addresses are listed alphabetically in the Index of Manufacturers on page 150.*

Astro Flight News

Astro Flight continues to introduce exciting new products for the electric flyer. New revolutionary 020 brushless motors that deliver more performance than can be imagined! New Super Whatt Meters, 13.8 Volt Power Supplies, a line of Dischargers, Super Gear Boxes for sport planes and Planetary Gear Boxes for sailplanes.

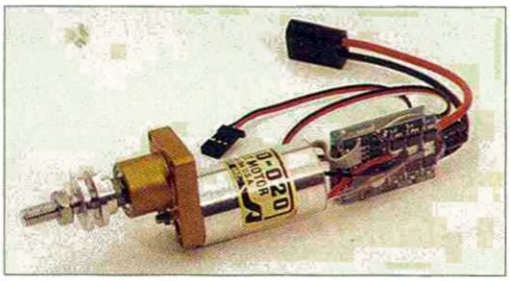
The Awesome 020 Pylon Motor!

Astro's New Brushless Pylon 020 is really Awesome! Now Speed 400 pylon racers fly over 100 mph! The Astro Brushless 020 Six Turn Pylon Motor with its 12 FET controller spins a CAM 4.7 x 4.7 at over 19,000 RPM. A truly awesome work of art.



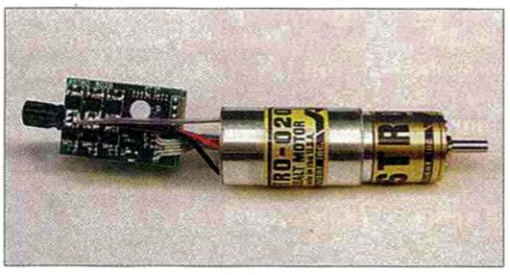
Vertical performance for 7 minutes!

This Brushless 020 motor with 3:1 Super Box spins an 11 x 8 CAM prop at 5,000 rpm on 7.5V and a 9x7 prop at 7,000 rpm on 9V. Dr. Keith Shaw demonstrated the 020 in his spectacular Bear-Kitty at KRC. The Bear-Kitty amazed everyone with its vertical aerobatics and 7 minute flights!



New Planetary Gear Box

Astro's New Planetary Gear Box for the 020 Brushless Motor features ball bearings, a 4.4:1 gear ratio and steel gears. The tiny Brushless 020 motor with this planetary box turns a 12 x 10 prop at 3,800 rpm on 7 cells and a 11 x 8 prop at 5,000 rpm on 8 cells. Designed to give your electric sailplane more thrust than you ever imagined!



The Amazing Super Whatt Meter

Astro's New Super Whatt Meter takes the guesswork out of electric flight. Now you will know your motor current up to 100 amps, your nicad voltage up to 60 volts, your motor power up to 5,000 watts and your nicad capacity up to 9,000 mahr. Stop guessing around and start making informed decisions!

New 13.8 Volt Power Supply

Astro's New Model 120 Power Supply delivers 12.5 amps at 13.8 volts. Its small size and light weight makes it easy to carry around. It features a special switching circuit that works from both 110VAC here in the USA and 220VAC found abroad. Perfect for powering our Astro Model 110D and 112D Digital Peak Chargers.

Nicad Discharger Erases Memory

Most nicad memory problems are caused by allowing the cells to self discharge on the shelf. Using these dischargers will erase nicad memory by discharging your nicad pack down to one volt per cell after every flying session. Model 102 for 6/7 cell packs, Model 103 for 10/12 cell packs and Model 104 for receivers and transmitters.

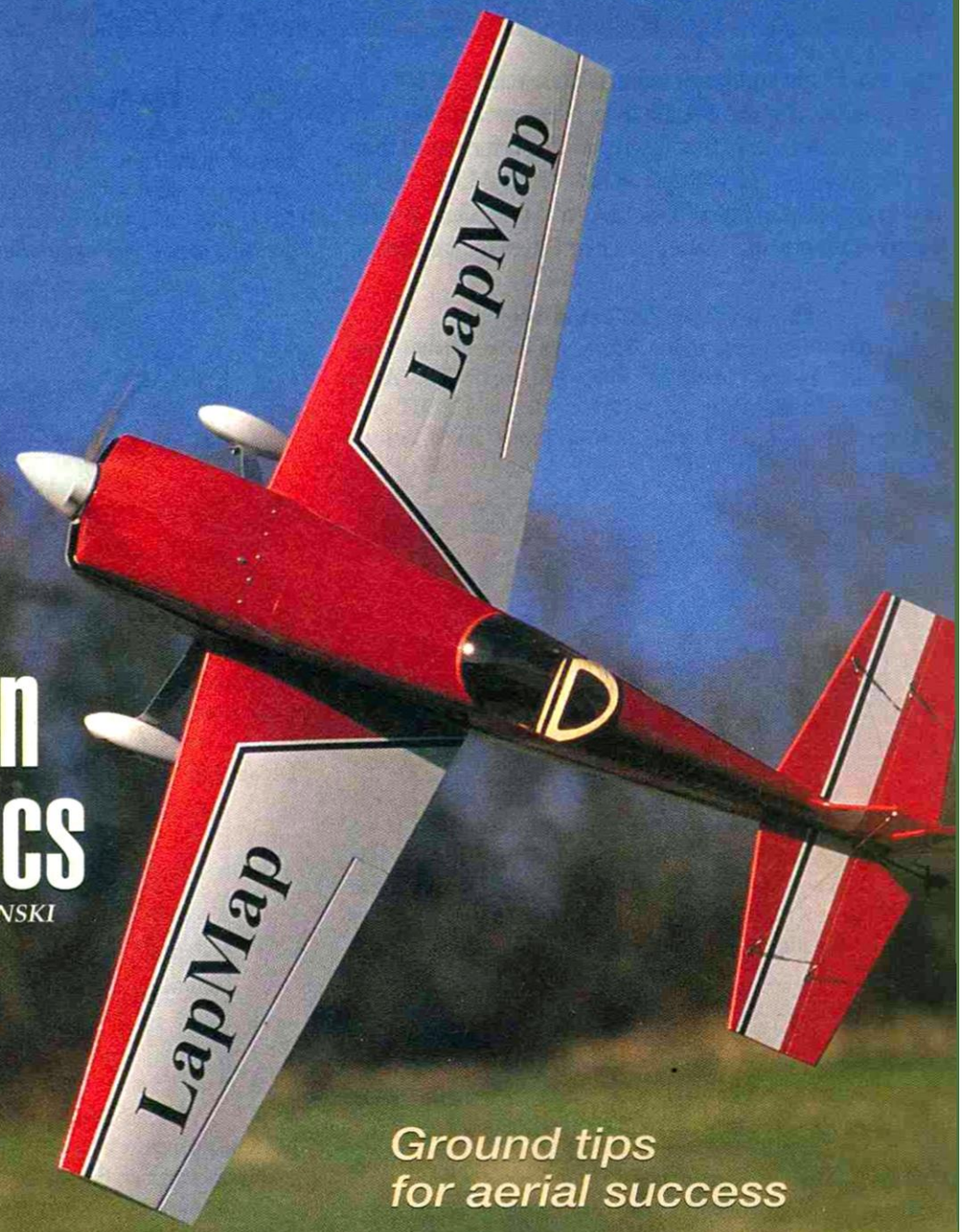
AstroFlight INC.

13311 Beach Ave., Marina Del Rey, CA 90292 • (310) 821-6242 • FAX (310) 822-6637
Visit our website at http://www.astroflight.com

MODEL AIRPLANE NEWS
HOW TO

TRIM YOUR MODEL FOR Precision Aerobatics

by DAN WOLANSKI



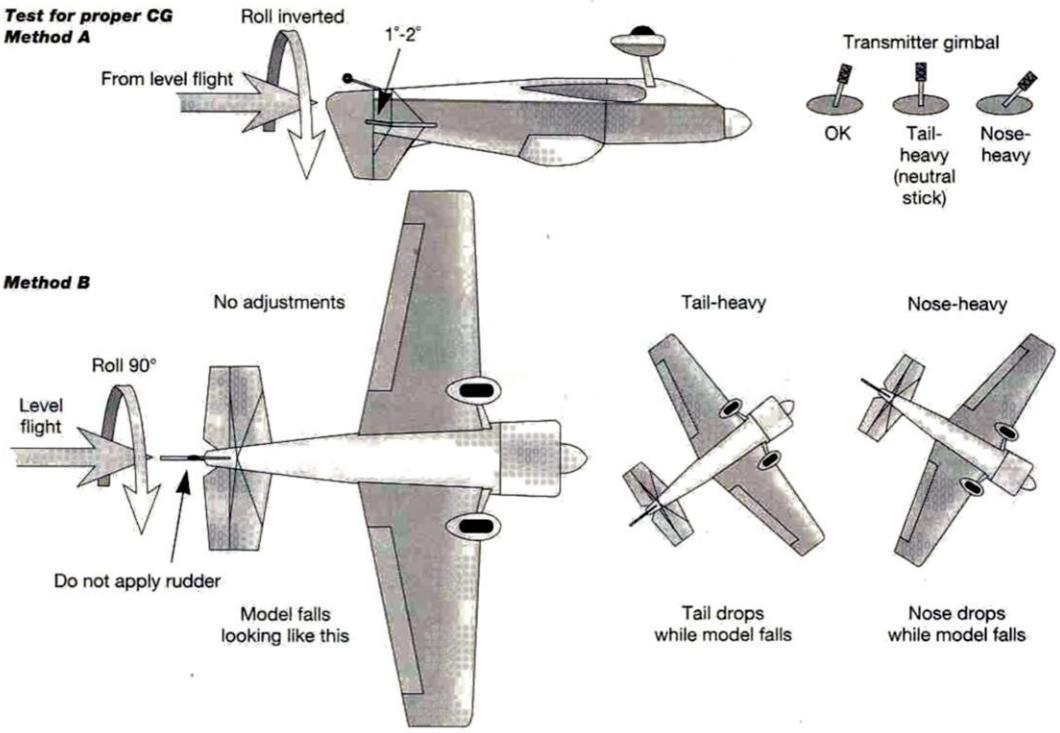
Ground tips for aerial success

HAVE YOU ever tried a hammerhead, Cuban 8 or humpty bump, only to have your plane fall out of the maneuver halfway through? You've seen these maneuvers performed by the same plane as you fly, but for some reason, you cannot duplicate them. Well, if you fly one of today's aerobatics designs such as an Extra, a CAP, or a Giles, it must be properly trimmed not only for straight-and-level flight but also for aerobatics.

Flight trimming for aerobatics is very different from just throwing in a few clicks of transmitter trim. It involves a series of setups designed to correct your plane's bad tendencies and to lay the foundation necessary for all aerobatics: pure inputs. By "pure inputs," I mean that when you add rudder, the plane yaws without showing a tendency to pitch or roll. Likewise, when you apply aileron, your plane must roll on an imaginary line without making a heading change. Before you can ever hope to do precision aerobatics, your plane must be able to follow pure inputs at any attitude and speed. This concept may be new to you, but I assure you that every TOC and competitive aerobatics pilot works endlessly to achieve it. If you follow the setup procedures and practice the flight maneuvers described here, you'll be able to successfully set your plane up for pure inputs and practice aerobatics with the same advantages as the top pilots.

GROUND CHECK

Before putting your plane through any set of aerobatics, make sure its static setup is perfect. Eliminating setup flaws now will ensure that your work in the air will be constructive and predictable. If you bypass this step, your plane will not perform consistently enough for you to make sense out of



the flight-trimming procedure.

To prevent airflow transfer, make sure all the hinge gaps are sealed with covering. Because control surfaces operate on pressure differential, it is essential that you not lose air pressure between the trailing edge and the hinged surface. If the gap is left unsealed, it will allow the transfer of pressure and will decrease the effectiveness of your surface. More important, the air transfer will vary with speed and attitude, making it impossible to trim the plane properly when it's airborne. To avoid this problem, disconnect the ailerons from the linkage; extend the ailerons to the maximum upward position and cover the V-shaped crevice. Do the same for the elevators, and seal your rudder gap as well.

Now buy a good-quality deflection meter and measure the throw of each control surface. Each elevator half must travel the same distance up and down. The same goes for the ailerons; if one aileron has greater travel than the other, you will *never* achieve a perfect roll.

Check all of the incidences. Be sure they match those called for on the plans. Check and double-check to make sure your stab and wing are perfectly aligned. (If you have a large plane with a big chord, use the Robart* meter and 36-inch conversion.) It's a good idea to check the elevator halves with an incidence meter to be sure that they are centered, too. Simply turn on your radio and check each elevator half by attaching the meter to your horizontal stab. Use the same meter for both sides to show any instrument error. Be sure your plane is propped up securely when you move the meter from one side to the other.

Eliminate control-linkage slop by using superior hardware. If you have any slop in your system, your surfaces will not center properly, and you will always wonder why the plane doesn't respond precisely to control inputs. Do yourself a favor and spend a few extra dollars on some really good hardware.

Set your control throws to the minimum settings given in the plans. Contrary to popular belief, most precision aerobatics are done using very little control throw. If your setup allows too much travel, it will be difficult to make minor flight-heading adjustments, and this will make maneuvers look jumpy and erratic. On my 30-percent Extra 300S, I use 8 degrees up-elevator and 10 degrees down. Ailerons are set at 11 degrees up and 9 down (for differential, which we will discuss later). The rudder is *not* set for maximum deflection; start at about 20 degrees and work from there.

BASIC FLIGHT TRIMMING

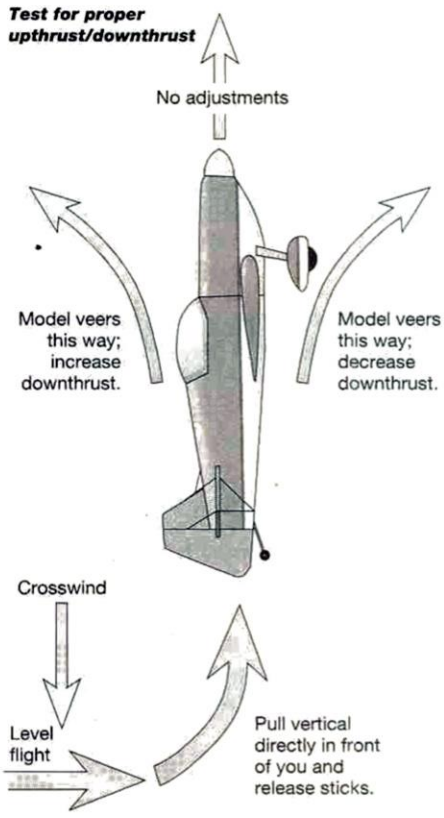
Aerobatics flight trimming is highly dependent on the airplane's thrust line and CG. Before beginning, make sure the CG and engine thrust are perfectly set. Changing them after you've started trimming for aerobatics will change the airplane's characteristics and flight trim. Consider the CG and engine thrust as your foundation; if you change them, you change everything.

Start with the CG (refer to the chart, "Flight Trimming"). To test for proper CG, roll the plane inverted and gauge how much down-elevator is required for level flight. You should be able to fly inverted while adding only a little down-elevator. Another test is to roll to knife-edge from straight flight and observe how your plane falls. If the nose falls first, the plane is probably nose-heavy; if the tail falls first, it is tail-heavy. Change the CG by moving the battery pack. Resist the temptation to add weight; after all, lighter is better.

Now that the CG is set, you need to work on the thrust line. Fly your plane through a set sequence of vertical uplines to quickly see exactly what is needed. Refer to the chart, and make the appropriate changes before proceeding. After all, if your plane won't track vertically on its own, you will have to wrestle with it constantly. Remember, the goal is to have your plane fly as true as possible at any attitude without your having to make constant inputs.

AEROBATICS FLIGHT TRIMMING

The secret to this can be summed up in three words: rudder, rudder, rudder! In



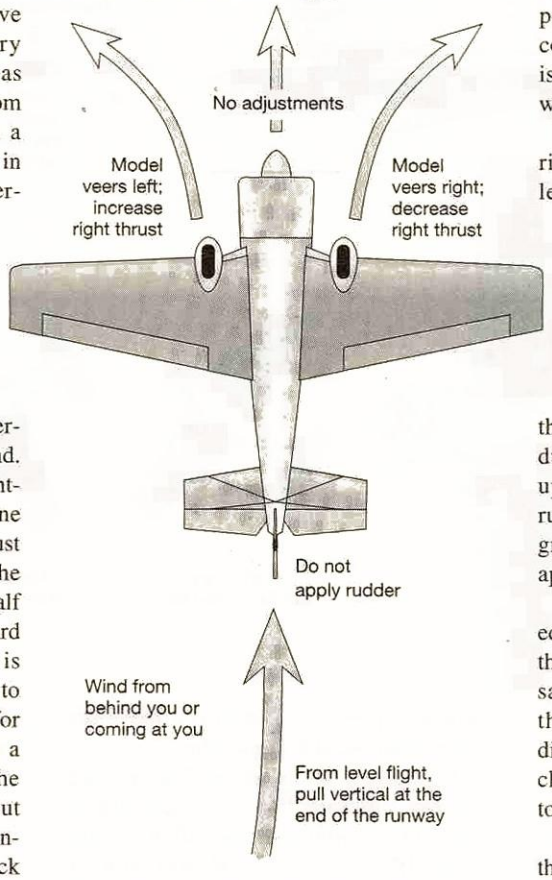
aerobatics, the rudder is the most important control surface. Without it, competitive aerobatics pilots would have a very difficult time making the plane look as though it's always the same distance from the flightline. Notice I said "look." In a perfect world, rudder would be required in only a few maneuvers, such as hammerheads, snaps, spins and knife-edge. I have yet to meet anyone, however, who can successfully complete a sequence without using rudder to correct a bad entry or exit. Crosswinds and gusts can also necessitate the extensive use of rudder.

Let's say you decide to do a hammerhead (stall turn) to turn the plane around. By definition, a hammerhead is a constant-radius pull followed by a vertical upline into a stall. During the stall, the plane must rotate around its CG and head down the path it followed on the way up (within half a wingspan). You pull your plane upward and immediately notice your heading is slightly off; so you input a little rudder to correct it, but your plane is not set up for pure inputs. The rudder input introduces a pitch and roll, and you quickly find the model no longer heading straight up but moving away from you slightly and beginning to roll. So you pull the throttle back and hit the rudder, but the plane flops forward and earns you a big zero! Sound familiar? Now you know the importance of pure inputs and rudder corrections.

ACHIEVING "PURE INPUTS"

Now that you're sold on the importance of pure inputs, let's go over how to achieve them. First, set up your computer radio with two mixes. Make rudder the master and ailerons the slaves. On the second mix, make rudder the master and elevator the slave. Be sure to turn off every other mix that may have come with your radio—especially the aileron-to-rudder mix, which plays no part in aerobatics.

Test for proper left thrust/right thrust



Now you'll fly the plane in knife-edge and program out the bad tendencies or coupling using these two mixes. (Coupling is the airplane's tendency to roll or pitch with the application of rudder.)

Fly your plane from left to right, roll right 90 degrees, and apply just enough left rudder to sustain knife-edge flight. Do not apply full rudder. Observe what your plane tends to do. A scale aerobatics design will usually pitch downward (toward the wheels) and roll left. Do this a few times to be sure. Now, land the plane, turn off your engine and begin to program out the coupling. If your plane pitched down during knife-edge, program a few percent up-elevator with the application of left rudder. If your plane also rolled left, program a few percent right aileron with the application of left rudder.

Continue until you can achieve knife-edge flight by using only rudder. Now fly the plane from right to left, and make the same observations and adjustments until the plane will fly knife-edge in either direction using only rudder. You are very close to having pure inputs, but you need to check a few more things.

Fly the plane straight and level at ½ to ¾ throttle, and apply a little rudder to get the plane to slide. Does the plane begin to slide nicely into a beautiful, large, flat turn? If it doesn't, observe what it tends to do (note that a little pitch-down is normal owing to the extensive drag you introduced by turning the fuselage). Now fly the plane from either direction, and pull it straight up in front of you so you see only its side. Apply a little

FLIGHT TRIMMING

TO TEST FOR	TEST PROCEDURE	OBSERVATIONS	ADJUSTMENTS
Proper CG —method A	Roll model inverted.	A. Slight down-elevator required for level flight. B. Significant down-elevator required to sustain level flight. C. No down-elevator required to sustain level flight.	A. No adjustments. B. Move battery pack backward. C. Move battery pack forward.
Proper CG —method B	From level flight, roll model to knife-edge.	A. Model falls without dropping nose or tail. B. Nose drops. C. Tail drops.	A. No adjustments. B. Move battery pack backward. C. Move battery pack forward.
Engine thrust —up/down	Fly model out around 100 yards, pull to a vertical climb directly in front of you, release sticks and observe deviations.	A. Model continues straight up. B. Model pitches toward wheels. C. Model pitches toward canopy.	A. No adjustments. B. Decrease downthrust. C. Increase downthrust.
Engine thrust —left/right	Fly model straight and level into the wind and pull vertical.	A. Model continues straight up. B. Model veers left. C. Model veers right.	A. No adjustments. B. Increase right thrust. C. Decrease right thrust.
Knife-edge flight —pitch	Fly model into wind, maintaining knife-edge flight with minimal rudder. Do this from each direction.	A. Model continues on knife-edge without deviation. B. Model pitches toward landing gear. C. Model pitches toward canopy.	A. No adjustments. B. Mix in up-elevator with rudder. C. Mix in down-elevator with rudder.
Knife-edge flight —roll	Fly model into wind. Do this from each direction, maintaining knife-edge flight with minimal rudder.	A. Model continues on knife-edge without deviation. B. Model tries to roll.	A. No adjustments. B. Mix in opposite aileron with rudder.
Aileron differential	Fly model level heading into the wind or downwind. Pull to a 45-degree climb, and roll with aileron.	A. Model rolls without yaw. B. Model exits yawed in opposite direction of roll. C. Model exits yawed in direction of roll.	A. No adjustments. B. Increase differential. Increase up-throw on aileron. C. Decrease differential. Decrease up-throw on aileron.

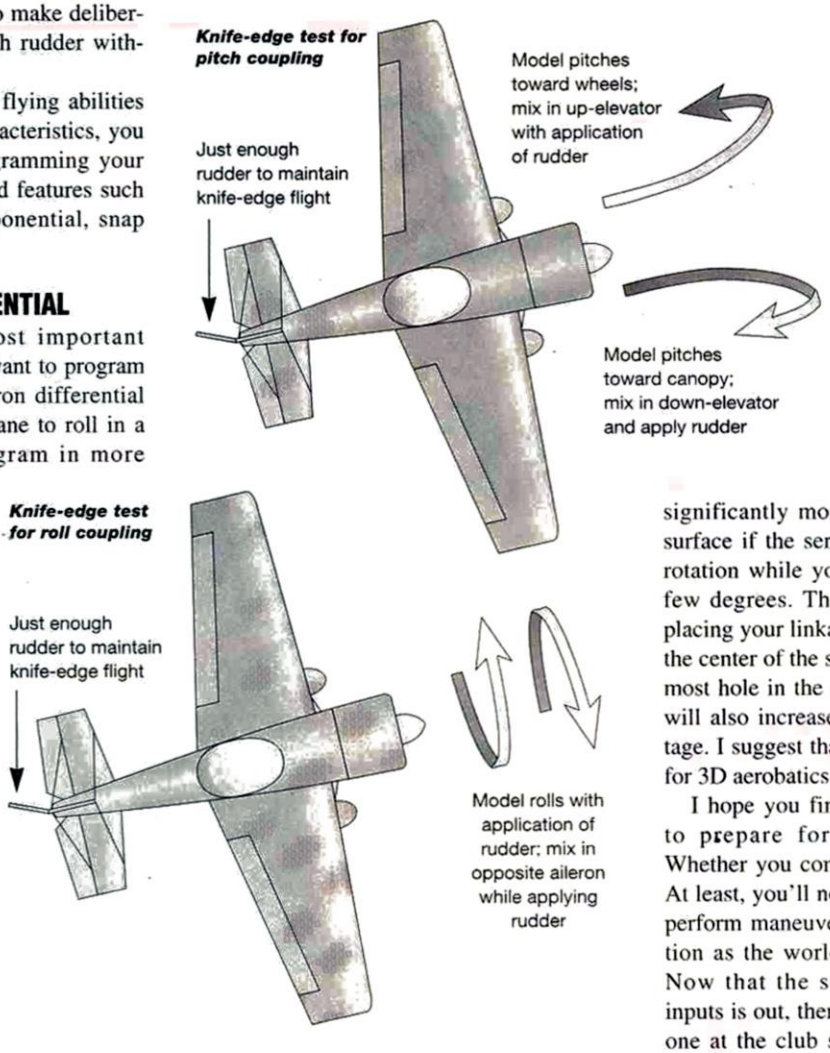
rudder as it flies straight up, and observe it. Finally, fly the plane inverted in the same direction as before and apply the same amount of rudder. If the plane pitched or rolled in the same direction during the flat, vertical and inverted tests, go back into the mix and correct it. If the plane pitched or rolled in a different direction in each test, you may have a misaligned tail group. Keep in mind that few aerobatics designs will ace all of these tests. Sometimes, the best you can achieve is an acceptable average.

Your plane now has pure inputs. Go through some simple maneuvers, maintaining a constant heading by using rudder. You should easily be able to make deliberate heading corrections with rudder without having to add coupling.

To further enhance your flying abilities and your plane's flight characteristics, you may want to consider programming your computer radio for advanced features such as aileron differential, exponential, snap switches and dual rates.

AILERON DIFFERENTIAL

This is probably the most important advanced feature you will want to program into your transmitter. Aileron differential offers a way to get your plane to roll in a more axial fashion; program in more up-aileron than down-aileron. The most commonly accepted theory of why this works says that the downward-deflected aileron creates more drag than the upward-deflected aileron, and that induces a yaw during a roll. To test for this, fly your plane downwind and directly away from you. Pull it to a 45-degree upline and roll it once. If the nose is yawed slightly after the plane has completed the roll, the plane needs aileron differential. To compensate for this differential, a scale aerobatics design such as an Extra will usually require approximately 2 degrees more up-aileron than down-aileron. You may need different amounts of up- and down-aileron for right and left rolls.



EXPONENTIAL

This is essential if you want your maneuvers and corrections to look graceful. Exponential offers a simple way of making the control surfaces move less around the neutral stick positions. This is one very nice way to hide minor corrections when your knees and fingers are shaking. When setting this up, be careful to ensure your sticks become *less* sensitive around neutral and not more sensitive. Futaba* and JR* use opposite sign conventions (+ and -) to achieve the same results on their transmitters. On my Extra, I have the following exponential percentages dialed in: aileron—40, elevator—24, rudder—70.

SNAP SWITCHES

I've used a snap switch to do snaps during sequences, but I found myself in trouble when trying variations on a snap on downlines and while inverted. If you use a snap switch, be aware that if you plan to enter advanced competitions, you will handicap yourself for certain maneuvers. Many aerobatics routines require positive and negative snaps at nearly every attitude. Programming a snap switch for all of these scenarios is like taking aspirin for a broken leg. You may be able to limp your way through, but you will never be able to run with the competition. Snap switches are great when you are just getting started, but I suggest you do snaps manually when you are comfortable watching your plane fly through one.

DUAL RATES

I don't use dual-rate control throws because I dislike having to flip switches during an aerobatics sequence. Some planes, however, will not enter a spin or a snap unless the throws are considerably increased before the maneuver. Programming in dual rates offers an excellent way to set your plane up for maneuvers that may be difficult to do using low control throws.

Another use for dual rates is 3D aerobatics. With the flip of a switch, dual rates allow you to toggle between huge control throws and precision aerobatics. The drawback is that you must set up your mechanical linkage for huge control throws and then dial back your travel volume for precision flying. When you have your transmitter set to less than 100-percent travel volume, you aren't using your full servo travel. You will have significantly more precise control over a surface if the servo arm completes its full rotation while your surface travels only a few degrees. This is obtained by *always* placing your linkage as *close as it can go* to the center of the servo arm and in the outermost hole in the surface control horn. This will also increase your mechanical advantage. I suggest that you use different planes for 3D aerobatics and precision aerobatics.

I hope you find this information useful to prepare for precision aerobatics. Whether you compete or not is up to you. At least, you'll now be able to practice and perform maneuvers with the same foundation as the world's top aerobatics pilots. Now that the secret to obtaining pure inputs is out, there is no reason why everyone at the club shouldn't be able to do a beautiful hammerhead, Cuban 8, or any other aerobatics maneuver.

For more information on competitive scale aerobatics, join the International Miniature Aerobatics Club (IMAC) and receive its quarterly newsletter. Send $20 to Dave Arndt, c/o IMAC, 2903 Forest Ln., Lorain, OH 44053-1554. If your interest is in pattern (very similar to IMAC but with different restrictions on aircraft size and weight) join the National Society of R/C Aerobatics and receive its monthly newsletter, "The K-Factor." Send $30 to Maureen Dunphy, c/o NSRCA, P.O. Box 3028, Muncie, IN 47307-1028.

**Addresses are listed alphabetically in the Index of Manufacturers on page 150.* +

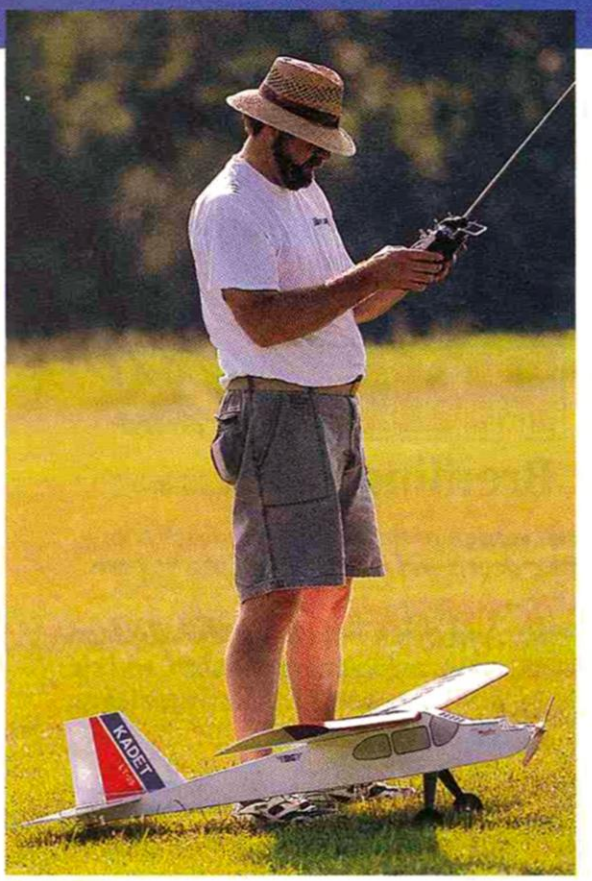
MODEL AIRPLANE NEWS

FIELD & BENCH REVIEW

Sig Kadet LT-25

Laser-cut trainer for glow or electric

by GREG GIMLICK



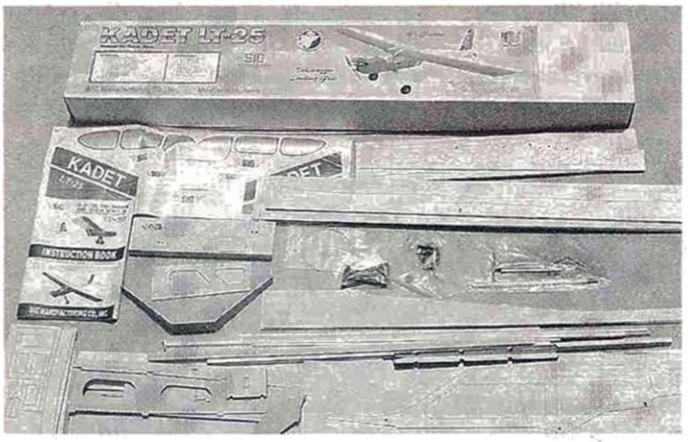
WE'RE PRODUCTS of our backgrounds, or so I'm told, and perhaps that explains my belief that there should be a trainer in everyone's stable. Maybe it's just good sense; maybe it's a result of being a retired Army instructor pilot, but I recommend this to everyone regardless of experience. There's nothing like a good trainer to help you regain confidence after some bad luck, or to keep your fingers in shape with nice landings after tearing up the sky with aerobatics. Sig Mfg.* has long had a reputation of designing and kitting good airplanes, and it has certainly continued that with the production of its Kadet LT-25 trainer.

This all-balsa, built-up design is laser-cut and comes with a well-organized instruction manual. It's a great project for beginners and just a dream for experienced builders; if there is such a thing as a balsa tranquilizer, this is it. Because my primary interest is in e-flight, I electrified the kit, but I made no structural modifications other than changing the power system. My goal was to see whether this would be an easy conversion for beginners in electrics. It's even better than I had hoped, so let's take a look.

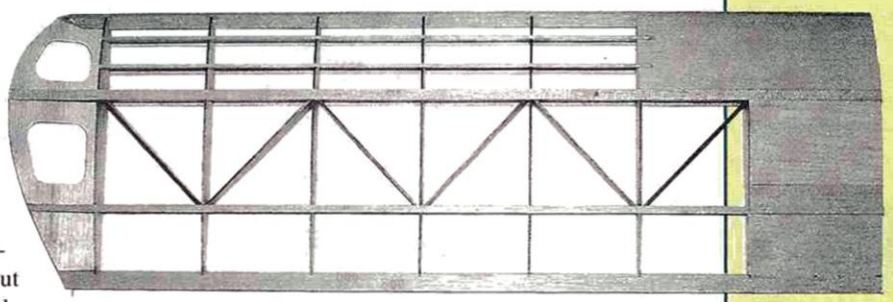
PHOTOS BY GREG GIMLICK

WING CONSTRUCTION

One of the first steps is to cut the main spars to length, but I recommend leaving the spars full length until the ribs and shear webbing are in place. I do this by habit, but if you cut the spars to length first, you sometimes find that they are shorter than the actual notched trailing edge (TE), or shear web, pieces.



Left: the contents of the kit. Below: the right wing panel is dry-assembled over the plan.



Assemble the wing parts first, and then glue the joints after everything is in place; this is only possible because of the incredible fit of the laser-cut parts. I've never had a wing with precut pieces go together this well. There are many helpful photos in the manual, and you'll find that each wing half can easily be built in an evening. The servo cutout for the ailerons only needs to be knocked out because it is already laser-cut. If you've never reinforced the center joint of a wing or installed aileron torque rods, don't despair; it is illustrated and explained thoroughly.

FUSELAGE AND TAIL CONSTRUCTION

Mark the thrust line on the firewall using the little laser cuts as a guide. I skipped setting the blind nuts for the glow engine mount. I left the firewall as is until the fuselage was complete and then mounted a MaxCim* motor mount to line up the prop shaft with the thrust line. You could do this at the start if you have all the pieces when you begin. Someone must have been thinking electric when he designed this kit: it has no heavy plywood reinforced sides and uses balsa doublers only where needed. After a few of the main formers have been put in place and

SPECIFICATIONS

Model: Kadet LT-25

Type: high-wing trainer

Manufacturer: Sig Mfg. Co.

Wingspan: 63 in.

Wing area: 724 sq. in.

Wing loading: 19 oz./sq. ft.

Length: 57 in.

Weight: 96 oz. (6 lb.), as flown

Engine recommended: .25 to .32 2-stroke, or .20 to .26 4-stroke

Power used: MaxNEO-13Y brushless motor, geared 3:1 with Maxu35B-21 controller

No. of channels req'd: 4 (throttle, ailerons, elevator and rudder)

Radio used: Futaba 8UAF, Hitec 535 receiver and standard servos

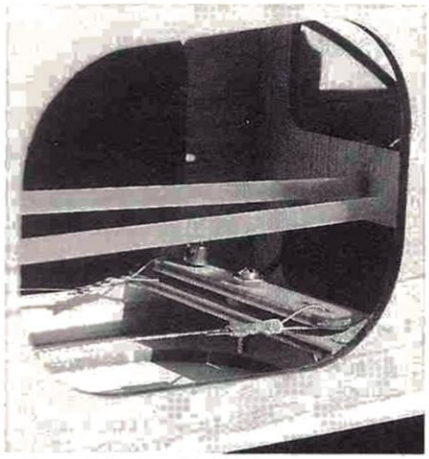
List price: $86.95

Features: this laser-cut, all-wood kit comes with a complete hardware package, full-size plans, formed-aluminum main gear and a photo-illustrated instruction manual with toll-free phone numbers for questions.

Comments: this is a great electric conversion and probably the closest thing to a perfect kit that I've seen.

Hits
- Excellent parts fit.
- Ease of construction.
- Complete package of good-quality hardware.
- Good flight characteristics.

Misses
- None.



The tailwheel pull/pull tiller bar assembly.

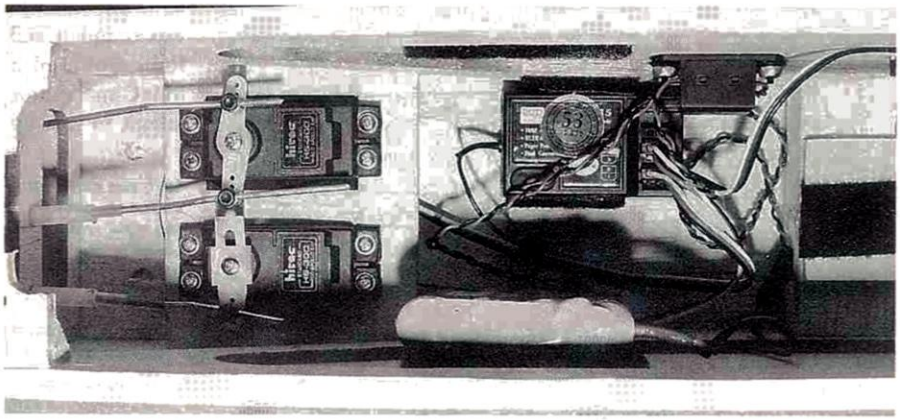
glued, repeat the dry assembly process and glue the joints. The laser-cut parts fit perfectly, and the fuselage came out perfectly straight, but do this over the plan to be sure everything lines up.

When it's time to add the outer control tubes, you're in for a real treat. Every former has a laser-cut hole in it for the tube to run through, so it is fully supported. The tailwheel uses a pull/pull system, and the exit guides for those and the rudder tube have also been cut. What a great way to learn how to properly set up pull/pull cables; it's also clearly depicted in the manual.

The horizontal and vertical stabilizers are also laser-cut with the exception of the square ribs, which you cut out of the supplied stock. The rudder and elevator are one-piece, laser-cut pieces with preshaped leading edges (LEs). I was impressed to see that the rudder and elevator also have lightening holes cut into them. The vertical stab has protrusions on the LE and TE pieces that will match up to precut holes in the fuselage and horizontal stab to ensure a good joint and alignment when the plane is assembled.

FINAL ASSEMBLY

I moved the radio gear aft of its designated location so I would have more leeway in adjusting the motor-battery location for proper balance. This caused me to move the tailwheel tiller assembly behind the aft cockpit former, so I installed the pull/pull cables before I covered the bottom and sides of the fuselage. The only downside to this is if I ever have to service the pull/pull cable, I'll have to cut some covering in the bottom of the fuselage. On the positive side, there's a lightening hole in the fuselage right below the tiller, so I could easily work through that and just recover the hole.



Radio installation with standard Hitec HS-300 servos and RCD 535 receiver. There's lots of room for regular-size gear, and the extra weight doesn't adversely affect the Kadet's flight characteristics. The rudder servo on the top has two rods, one to the rudder and one to drive the tailwheel tiller bar.

You can use any iron-on covering on the model, and I chose Aero Span* Cessna White and MonoKote* Bright Red, which worked well and almost matched the red on the provided decals. After you've covered all the parts, simply remove the covering where the tailpieces will be glued together and begin the final assembly as shown in the manual. When you apply the decals, use the wet-application method described in the manual to avoid bubbles and ensure good alignment. The windows are also decals that come in the kit. They will line up well if you follow the instructions. CA-type quick hinges are provided along with all the other necessary hardware.

MY CHANGES

Besides moving the radio, I made a bigger hatch toward the nose and bolted on the wing instead of using rubber bands. I have no problem with using rubber bands to secure wings and have flown many electrics that way, but I wanted a cleaner look. There's plenty of room at the back of the wing for hold-down blocks, and the front former is high enough so the LE of

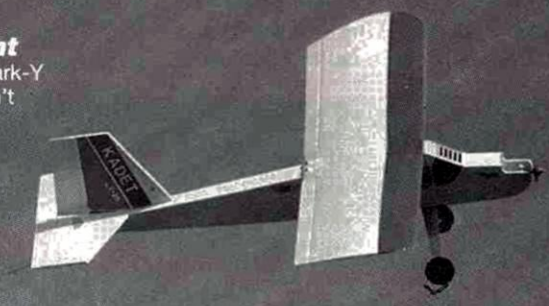
FLIGHT PERFORMANCE

• Takeoff and landing

This is a conventional gear (tail-dragger) plane, so takeoff and landing may offer some challenges that beginners are not used to, but there are no surprises. The tail came off the ground in about 50 feet, and the plane tracked well with more-than-adequate rudder response at low speed. Landing was uneventful, and the plane slows down extremely well while assuming a level attitude that makes main gear landings a thing of beauty. With the power available, I can make it hop right off the ground, but that just isn't as much fun or nearly as pretty as running with the tail up.

• High-speed flight

This is a trainer with a Clark-Y airfoil, so the model wasn't designed for high-speed flight, but it will cruise along at faster than training speed, if you want it to. It does accelerate quickly when you need it to and is not twitchy at higher speeds.

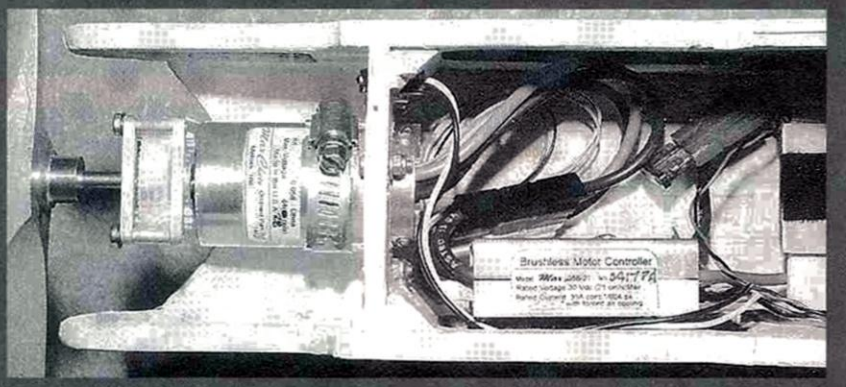


• Low-speed flight

I consider this to be very important for a trainer, and this airplane is custom-made to go slow. In fact, when I went to stall it, I couldn't. At low throttle and full up-elevator, it just mushed along straight ahead and descended gently, never really entering a "stair-step" profile. I finally pulled back the throttle trim to use the brake and stop the prop completely, and the plane acted the same way. This is a perfect approach trainer that will forgive students who fly it too slowly.

• Aerobatics

The Kadet will loop nicely, and rolls can be accomplished with just a touch of elevator as it goes inverted. Sustaining inverted flight will require a bit of down-elevator, but the Kadet will fly upside-down.



POWER PACKAGE

I chose to use the new MaxNEO-13Y brushless motor package for this project because it's a system a beginner or an experienced flier can grow with. Although I targeted 14 cells, I can use this same system in another plane and use up to 21 cells on the controller and up to 28 cells on the motor. I've used MaxCim motors before, and this is more than an upgrade to their previous offerings; it's a whole new animal. The new MaxNEO motor uses hi-flux neodymium magnets, and this has given it an increase in the torque constant and a corresponding increase in the motor constant. MaxCim also used a different coil winding and larger lead wires that have dramatically reduced the motor resistance; if you're new to electric flight, these are very good things because more power gets to the prop and less is lost as heat.

The folks at MaxCim have also redesigned their controller to allow you to use battery eliminator circuit (BEC) for up to 14 cells, which is higher than any other system I'm aware of. This has been accomplished by using a 3A regulator, which also allows up to five servos to be used. BEC is not an issue for me in a plane of this size, but it's a big selling point for the folks in competition who need to save every possible gram of weight. The biggest thing I've noticed with the new system is its smooth, linear throttle response. I thought my old controller was good, but this one is noticeably better.

I ordered the package from MaxCim, complete with the optional remote LED indicator, motor mount and MaxGR3.0 gearbox, and it arrived ready to be installed. If you tell MaxCim what you want, they'll provide as close to a "plug 'n' play" system as you can get. Mine came with switch and fuse holder already soldered, so installation took only a matter of minutes. I built my own 14-cell battery using Sanyo 1700SCRC cells purchased from B&T R/C Products* and a Master Airscrew* 13x8 electric prop, and I was ready to go. I'm certainly not straining this system with 14 cells and about 23 amps; it's rated for up to 21 cells and 35 amps continuous current (60A peak).

With gearing changes and controller upgrades, this system can grow to meet my needs for anything from the Kadet up to a giant-scale airplane. The remote LED offers a quick visual check of its operation, and with entire flights being made at partial throttle, the controller and motor have yet to get hot (that alone is a big accomplishment). Add to this the quality and design of the MaxCim motor mount, and you've got a heck of a package.

the wing can be drilled for dowels or a tab such as I used. If you decide to do this, be sure to reinforce the area between the LE and main spar before you finish sheeting the wing. For the hatch, I used the kit material and made it removable by using a tab on one end and a retractable latch on the end that goes into the firewall. When this was all in place, I built a battery platform in the cockpit and installed a MaxNEO-13Y brushless motor and Maxu35B-21 controller. That's it; no other changes, and I don't think any are necessary on a plane this size and weight.

CONCLUSION

There's just no other way to say it: this is the closest thing to a perfect kit. I've never before said that about a kit, but this one is a builder's dream and a really nice flier. If you want an easy electric conversion trainer, this is it. If you build it for a glow motor as intended, I have no doubt the plane will be outstanding. My hat is off to Sig; there is now a new standard by which kits should be judged.

Addresses are listed alphabetically in the Index of Manufacturers on page 150.

Pietenpol Air Camper

Designed by B. H. Pietenpol

SPECIFICATIONS

Engine: Model-A Ford

Horsepower: 35 at 1,600rpm

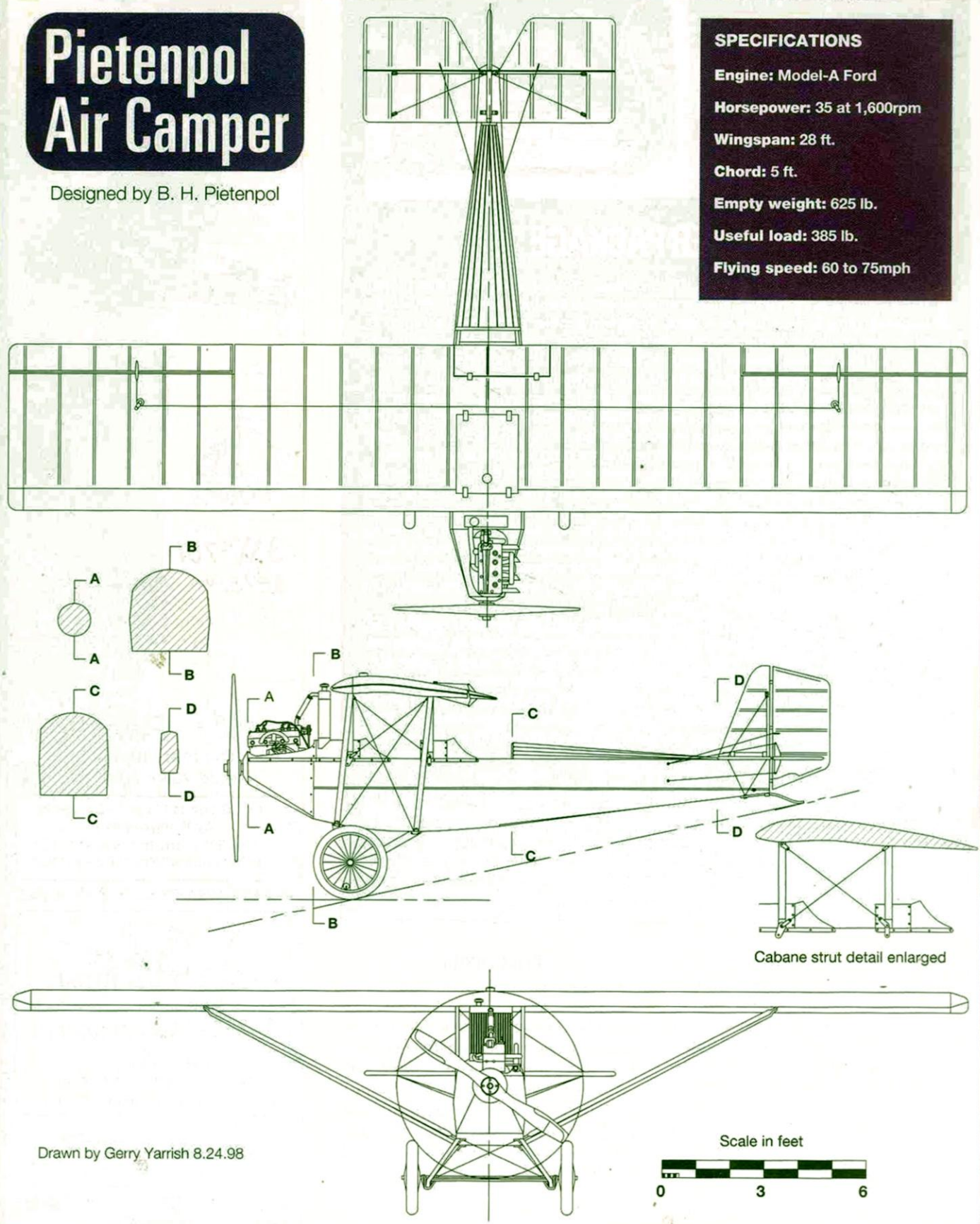
Wingspan: 28 ft.

Chord: 5 ft.

Empty weight: 625 lb.

Useful load: 385 lb.

Flying speed: 60 to 75mph



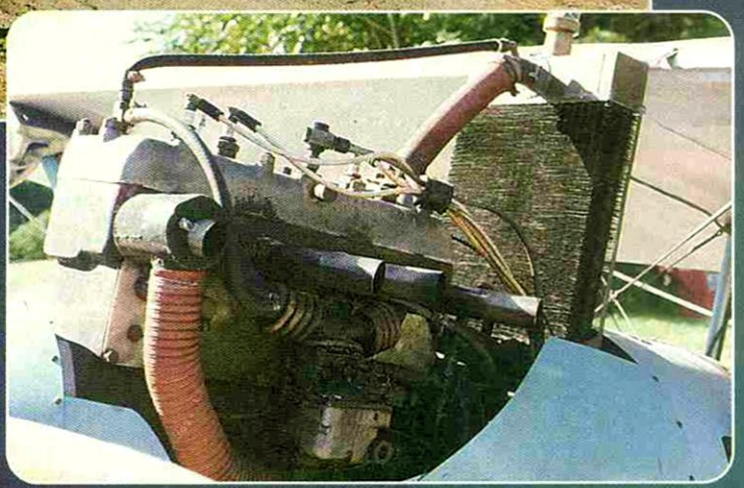
Bernie's Air Camper

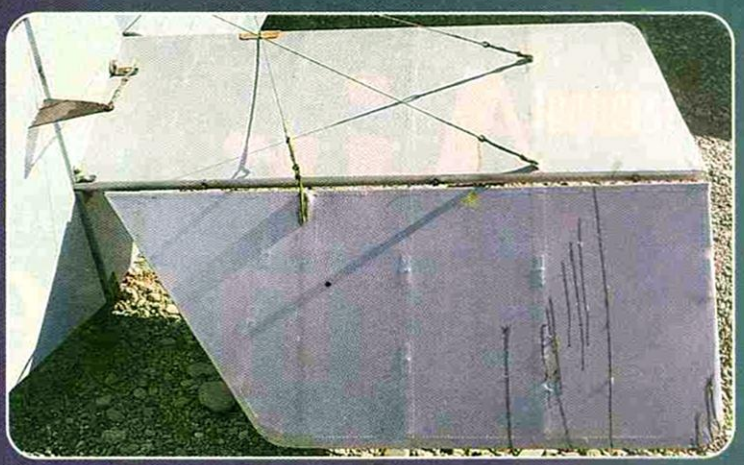
Quoted from the Pietenpol Hangar display, EAA Museum/Pioneer Airport, Oshkosh, WI:

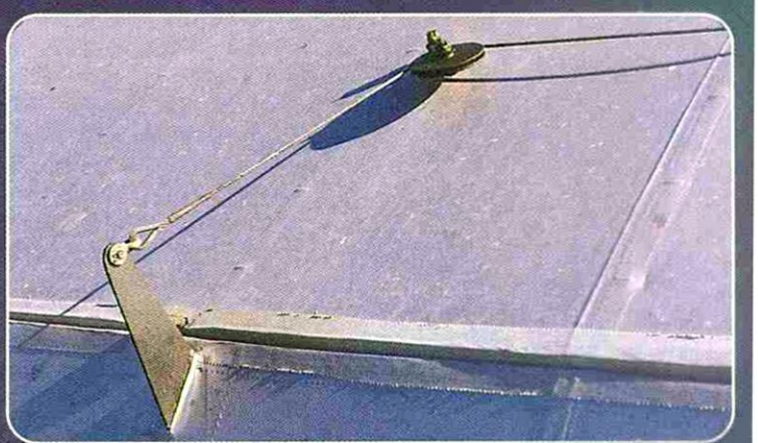
"Bernard H. Pietenpol pursued his dreams of flight from the '20s through his passing in 1984. His dreams were of planes powered by auto engines that nearly everyone could afford to build and operate. He first flew Gnome, then Ford Model-T powered planes without success. When the Model-A was introduced, Bernie had the powerplant he needed. The Pietenpol Air Camper would carry two people and reach speeds of 70mph behind its 4-cylinder, water-cooled Ford auto engine ...."

Born in the Great Depression years, the venerable Pietenpol Air Camper is perhaps the most famous of all early homebuilt designs. Pietenpol's famous parasol met the needs of the time and was designed to get off the ground, putt along slowly so its pilot and passenger could enjoy the local scenery and then return safely (and in one piece) back to earth. Bernie used construction-grade lumber and many inexpensive, surplus WW I aircraft fittings and hardware to keep the Air Camper as affordable as possible. Pietenpol designed his own undercambered airfoil (similar to the USA-27 airfoil) for the Air Camper, and to this day, it is still the preferred airfoil for those building modern-day examples of the Air Camper.

Bernard Pietenpol published his plans for the aircraft in *Modern Mechanics* magazine and wrote several articles for it as well as for *Popular Aviation* magazine. Plans for the original 2-seater parasol are still available from Bernie's son, Donald Pietenpol, 1604 Meadow Cir. S.E., Rochester, MN 55904; email: PietenpolDon@juno.com. +







Pietenpol Air Camper

by SIDNEY MILLER

IMAA-legal sport-scale classic

I HAVE ALWAYS felt that a scale model airplane should have three attributes: 1. a design that appeals to you personally; 2. lines that lend themselves to fairly easy construction; and 3. the aerodynamics for stable flight.

The Pietenpol Air Camper was designed by Bernard H. Pietenpol in Spring Valley, MN, and was first presented in 1930 in *Modern Mechanics* magazine. The Air Camper was one of the first successful, widely accepted homebuilt flying machines. Its powerplant was a converted Model-A Ford, water-cooled automobile engine that produced approximately 40hp. Construction was all wood, with some sheet aluminum used to cover the leading edge of the wing, as an engine cowl and on top of the fuselage. While a factory-finished Air Camper could be obtained from the Pietenpol factory for around $750, the raw materials were cheap, and anyone good at tinkering would find it simple to build. In fact, in my opinion, in the 40 years since Mr. Pietenpol designed the aircraft, nothing has been developed that can match the old Air Camper's combination of simplicity, ruggedness, low cost and docile performance.

The model in this article is based on the Air Camper as presented by Peter M. Bowers and drawn by Robert Parks in the August 1969 issue of

PHOTOS BY ROBERT MILLER

SPECIFICATIONS

Name: Pietenpol Air Camper

Type: sport-scale

Wingspan: 80 in.

Wing area: 1,160 sq. in.

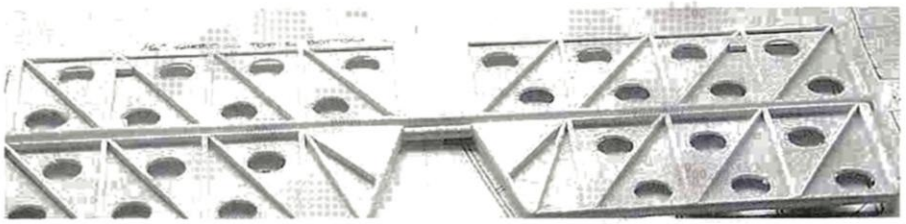
Length: 49 in.

Engine used: Thunder Tiger .91ci 4-stroke

Construction: balsa, spruce, lite-ply, aircraft-ply

Radio req'd: 4-channel (rudder, aileron, elevator and throttle)

Comments: this IMAA-legal Air Camper is an enlargement of my 35-inch, free-flight Pietenpol that was published in the October 1973 issue of *Model Airplane News*. Typical stick construction is used, including sheet balsa, spruce and plywood parts. The wing center section is glued to the spruce cabane struts and is simple to build. The outer wings plug in for ease of transportation. The model is very easy to build and fly.



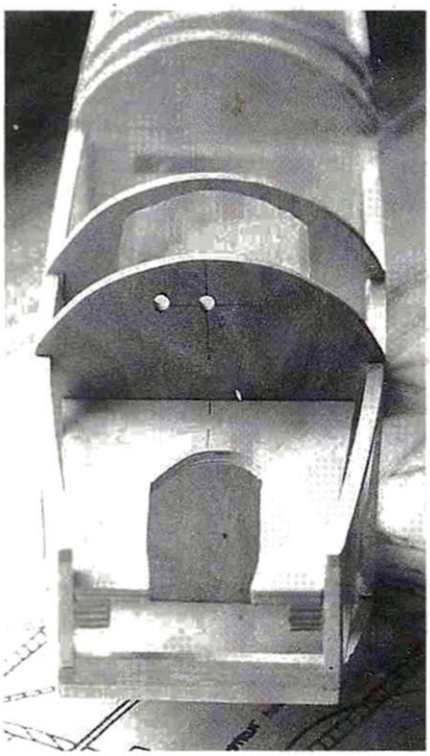
Above: the stab and elevator showing basic construction, filler pieces, 1/4-dowel elevator joiner and lightening holes. Below: view of rear portion of fuselage showing stringers, filler sheet balsa at sides and top.

American Aircraft Modeler. Pete's Air Camper was built in 1932 from *Modern Mechanics* plans obtained by Pete in 1956. He and a friend totally rebuilt and restored it over a period of years, until in 1968, it took first place in the class, "Golden Age Monoplanes (1919-1934)" at the Merced Fly-In.

Pete made only one noticeable change other than to use a three-piece wing (fixed center section and removable outer panels): he eliminated the wire bracing at the right side of the cockpit in favor of two diagonal struts that run from the front center spar to the rear of the engine mount. The radiator up front was not a problem, which explains why no windshields were used. It is easy to see around it when straight-ahead vision is needed, and the hot air flowing from the radiator during flight takes the chill out of the mainstream. The pilot knows whether he's slipping or skidding in his turns when he feels cool air strike one side of his face or the other. Just for comparison, the cruising speed for the "Piet" is about 70mph, maximum speed is about 80mph, and the landing speed is approximately 40mph.

To summarize, the Air Camper is different from—and yet typical of—the many fine homebuilts of that era. The moment arms and parasol wing make it a good flying model, one that has proven itself in rubber scale, free-flight scale and now in R/C scale.

The Air Camper is easy to trim, fun to fly and has twice won the prestigious Chicago School Masters Annual All Scale Meet. In October 1973, *Model Airplane News* published my first construction article of a smaller, free-flight Pietenpol Air Camper. Many plans have been sold, and I have met modelers at various contests who have told me how much they have enjoyed building and flying the Air Camper.



Below: front of fuselage showing beam mount, engine plate and holes for tank and fuel lines.

CONSTRUCTION

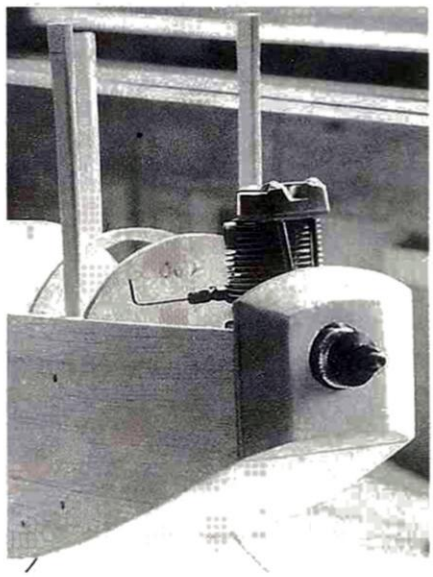
• **Stab and elevator.** Start by joining two pieces of 1/8x3x36-inch light sheet balsa to make a 6-inch-wide sheet. When dry, cut the outline of the stabilizer and pin it to the plans. On top of the outline, glue a 3/16-inch-square LE, 1/4-inch-square TE and 1/8x1/4-inch ribs. When dry, turn it over and repeat the process. Cut the elevator outline from the 1/8x6x36-inch sheet, and glue on the same size LE, TE and ribs. Note the areas on the plan that are to be filled with light 1/4-inch sheet balsa on both sides of the stab and elevator. Also note the hard-point locations for bolting of the rudder/stab brace wires.

• **Fin and rudder.** The construction of the fin and rudder is basically the same as that of the stab and elevator except for the sizes of the LE, TE and ribs (see plans). Construction is very simple and should present no problems.

The stab, elevator, fin and rudder may have lightening holes cut into them to keep tail surfaces as light as possible. The structure is more than sufficiently strong, no matter how large the holes are made.

• **Fuselage.** Cover the side view of the fuselage with clear food wrap or similar material to protect it from glue. Build the fuselage side using 1/4-inch-square balsa for the longerons and uprights and 1/8x1/4-inch balsa for the diagonals. The uprights at the nose and tail should be doubled. The last section at the tail should be filled with light 3/32-inch sheet balsa to provide an outlet for the elevator and rudder pushrods. The inside of the fuselage sides should be covered with 1/8-inch lite-ply from former B to former F (make sure that both pieces are on the inside of each side).

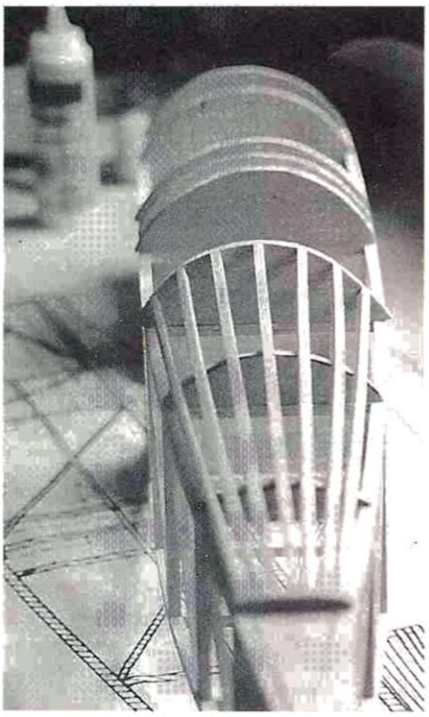
When dry, cover the first side with a layer of food wrap, and construct the second side directly over the first. Make sure that the 3/32-inch sheet filler at the tail will



Above: cabane struts glued and screwed in place, engine and nose block mounted, outside of fuselage sides sheeted with 3/32-inch balsa and 1/8-inch cross-grain balsa on the bottom.

be to the outside of both sides. While the glue is drying, cut out formers A through I (wood sizes are noted on plans). The two sides are then glued to formers B (firewall), C and E, which are all the same width and should give you a good, straight box. Then, pull and glue the tail posts together, and be sure to keep the fuselage sections rectangular and longitudinally straight. Glue in cross-braces, top and bottom (1/4-inch square), and add the remaining formers. The stringers are then fitted (note: only former G is notched, and J is a piece of 1/4-inch-square balsa that is sanded to shape).

Make the landing gear as follows: bend the forward and rear struts from 1/8-inch-diameter music wire, and bind and solder where they overlap at the bottom. It is important that the angles are adjusted so that the axle is parallel with the LE of the wing. On my original model, the axle is a straight piece of 5/32-inch music wire bound and soldered to the top of the strut

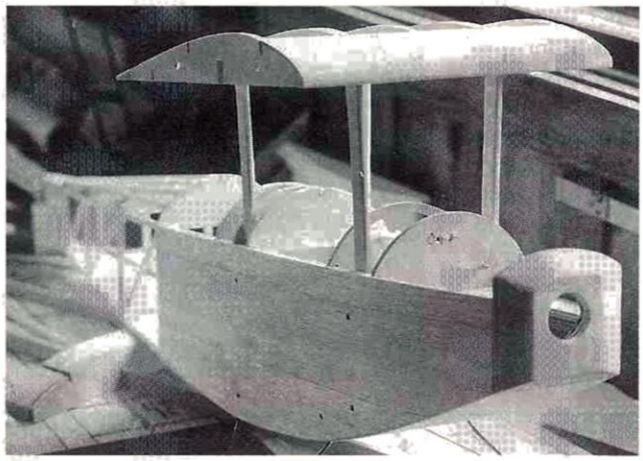


Rear view showing stringers and former tops.

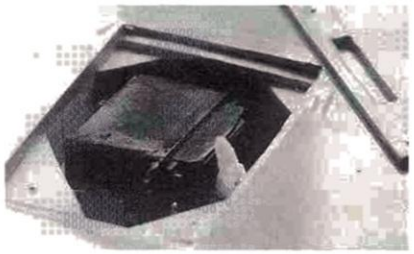
joint. The plans show a simpler, sport-model, landing-gear wire arrangement.

The tops of the landing-gear wires are sandwiched between two pieces of 1/8-inch plywood that have an 1/8-inch balsa-sheet filler piece. The whole assembly is then epoxied into the fuselage as shown on the plan. A neat trick for securing the wheels to the axle is to solder a piece of brass tube to the end of the axle with about 1/8 inch protruding past the end of it. The tube is then drilled, and a small cotter pin is inserted.

Glue the spruce cabane struts in place and, for added security, fasten each in place



Above: center section of wing fitted on cabane struts. Below: aileron servo hatch and hatch cover.



with two self-tapping screws or 2-56 bolts and nuts. Sheet the fuselage bottom with 1/8-inch cross-grain sheet balsa. Finally, add the two side stringers and the nose block. In preparing the firewall (former B) and former C, take into consideration whether you will mount your engine on wood bearers, wood bearers and a plywood engine plate (as I did), or on a commercial engine mount.

A unique feature of the Pietenpol was the automotive radiator that cools the engine. This stood vertically behind the engine and in front of the wing and was the reason that the pilot needed no windshield. I used 1/4-inch medium balsa, which I scored vertically with an awl to represent the radiator fins. The top and bottom areas were made from soft, thin, brass sheet and then "riveted" with pinheads. The

FLIGHT PERFORMANCE

As in all model airplanes, the center of gravity (CG) is one of the most important elements in stable flight. The Piet should balance at or slightly forward of the CG, as shown on the plan. I recommend 2 or 3 degrees of down-thrust for the engine, about 2 degrees positive incidence in the wing and the stabilizer set at 0 degrees. The lift struts are functional, and the model should not be flown without them. The model has shown no bad tendencies, and it is a pleasure to fly. The Pietenpol is easier to fly than most so-called trainers. Its parasol wing, low wing loading and general proportions make a very docile airplane.

• Takeoff and landing

Takeoffs are a thing of beauty. Aim the Piet into the wind and gradually increase power to about 1/2 to 3/4 throttle. It will roll out straight, and when the tail comes up, gradually feed in some up-elevator and watch the bird climb out gently. There are no bad habits to worry about.

Landings are a piece of cake. Throttle back almost to idle on your downwind leg, turn into the wind, set the throttle to idle and line up for landing. Again, the Piet does not show any bad habits and will slow down nicely with no sign of tip-stall or roll. If done correctly, it will roll out on its front wheels and as it slows, the tail will come down. Remember, as with all tail-draggers, feed in some up-elevator when taxiing.

• General flight characteristics

In flight, the Pietenpol is a graceful bird, and it is satisfying to do low passes, figure-8s, etc. Remember, this is a vintage homebuilt designed to use an automotive engine with a top speed of about 80mph. Full-size cruise speed is 60mph, and the Piet landed at 40mph.

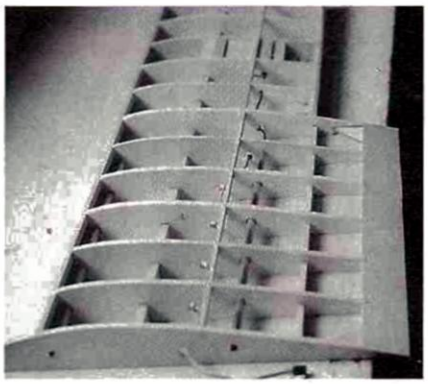
• Aerobatics

The Pietenpol is not designed for aerobatics; however, gentle aerobatics such as stall turns, Immelmanns, large, slow loops, etc., are possible for the more experienced pilot, or with a little practice.

For the beginner who wants a scale trainer, I highly recommend the Pietenpol. Its flight characteristics and simple, straightforward building methods make it suitable for even the first-time scale builder/flyer.

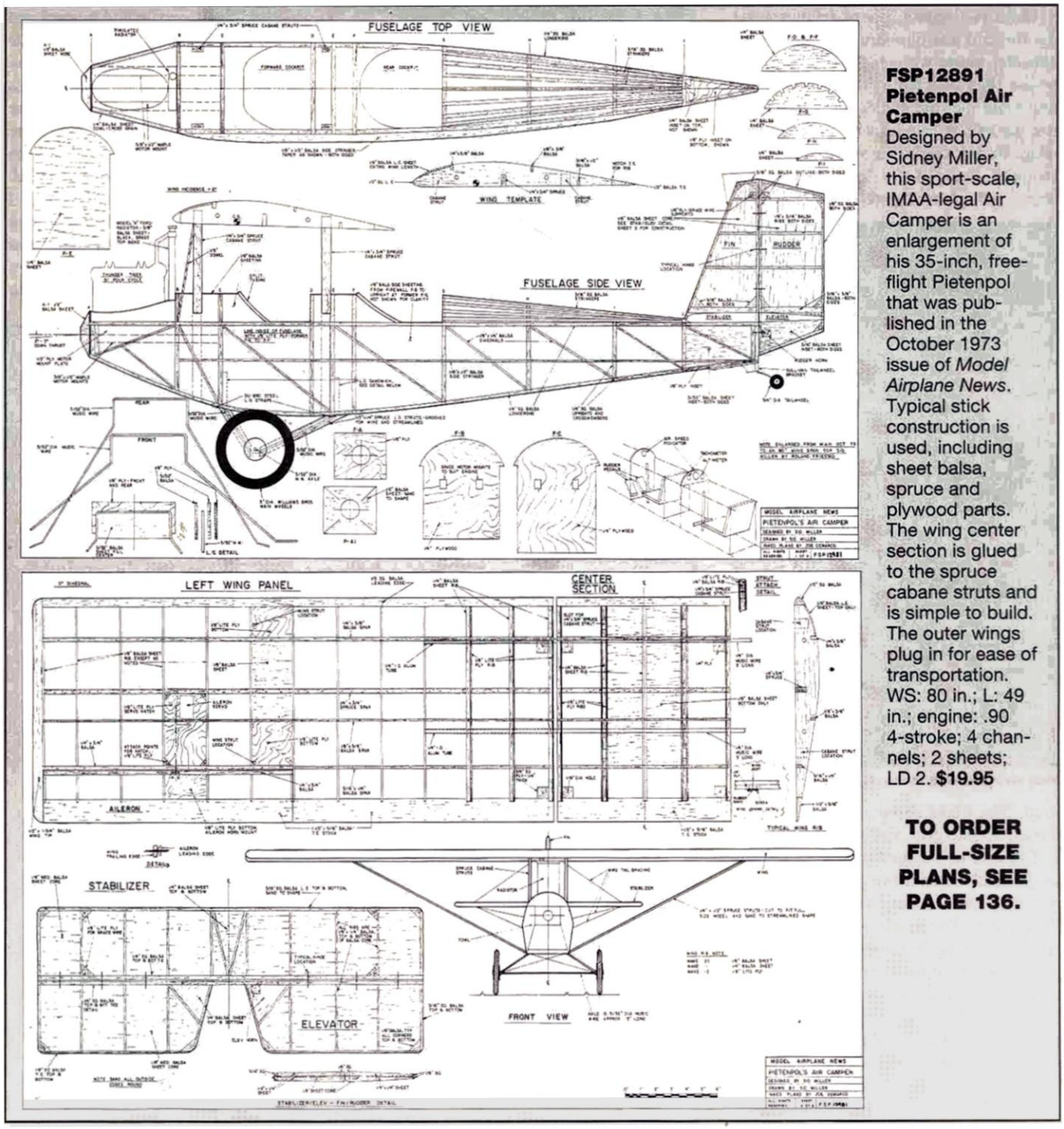
radiator portion is painted dull black.

Provision should also be made for your fuel-tank installation. I found it convenient to cut a tank-size hole in former C and slide the tank through. Much will depend on your choice of engine. I used a Thunder Tiger* .91 4-stroke engine, which proved ideal. The top areas from formers B to C and D to F are covered with 3/32-inch sheet balsa to create the cockpit's openings. To access the radio, I made a hatch on the bottom of the fuselage between formers C and D. I installed the throttle servo and radio on/off switch in the front cockpit. The rudder and elevator servos were installed in the bottom of the fuselage with access through the hatch. The RX battery should be placed between formers B and C.



Wing showing LE sheeting, aluminum tube, aileron area and gusset bracing. Also shown are the holes and aileron servo lead-out.

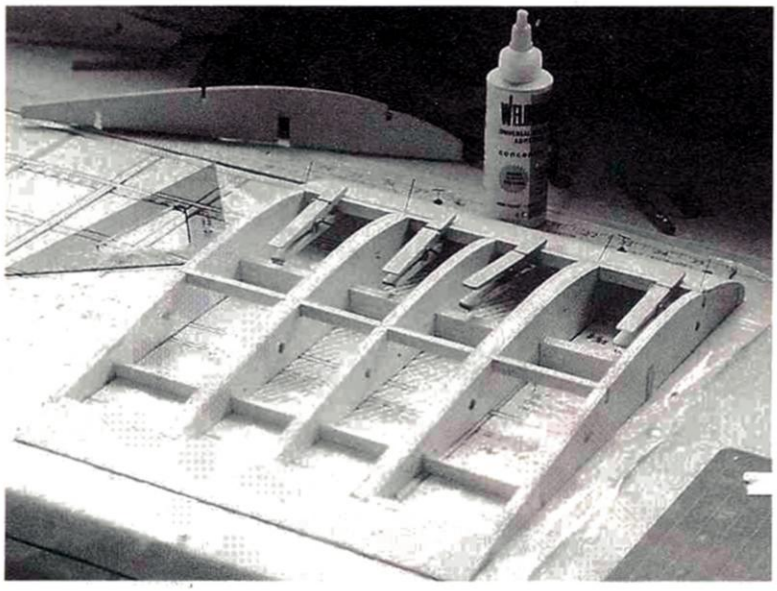
• **Wing**. Since all ribs are identical, it is desirable to first make a plywood or aluminum template of the rib shape. Make up the ribs as follows: 20 from 1/8-inch balsa, 11 from 1/4-inch balsa and nine from 1/8-inch

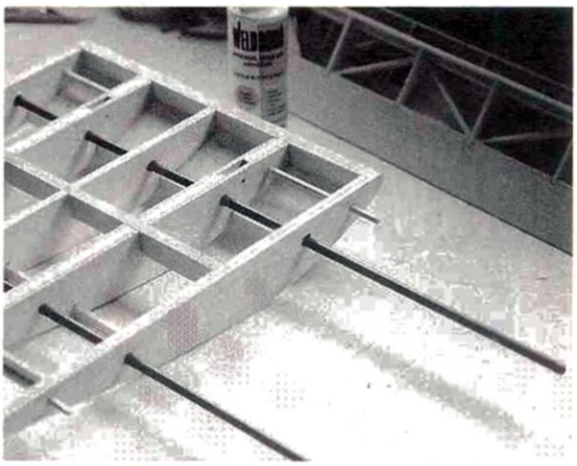


FSP12891 Pietenpol Air Camper

Designed by Sidney Miller, this sport-scale, IMAA-legal Air Camper is an enlargement of his 35-inch, free-flight Pietenpol that was published in the October 1973 issue of *Model Airplane News*. Typical stick construction is used, including sheet balsa, spruce and plywood parts. The wing center section is glued to the spruce cabane struts and is simple to build. The outer wings plug in for ease of transportation. WS: 80 in.; L: 49 in.; engine: .90 4-stroke; 4 channels; 2 sheets; LD 2. **$19.95**

TO ORDER FULL-SIZE PLANS, SEE PAGE 136.





Left: center section of wing showing LE sheeting glued and clamped in place. Above: center section of wing showing notches for wooden cabane struts and the 1/4-inch carbon fiber rods. Also note 1/8-inch dowels used to help align wing when joined.

plywood. Wing construction is straightforward and consists of a 1/2-inch-square LE, two top (balsa) and two bottom (spruce) spars and a solid, notched TE. Place the LE, bottom spars and TE over the protected plans and glue all the ribs in place. Add the top spars, the 1/2-inch-sheet wingtips and the 3/32 LE sheeting (top only, from top front spar to LE). The ribs that receive the cabane struts on the center wing section are made up of a 1/4-inch sheet balsa rib sandwiched between two 1/8-inch-ply ribs. The 1/4-inch-sheet rib should be notched to receive the cabane struts. Although I drilled and mounted the center section with 2-56 nuts and bolts to be able to change the angle of incidence, this proved unnecessary. If you wish, you can simply glue the center wing section to the cabane struts at the 2 degrees positive incidence. The ribs that require it should be drilled to receive the 1/4-inch-i.d. aluminum tube and the 1/4-inch piano wire or carbon-fiber rod. The aluminum tube is epoxied in the outboard wing panels, and the wire is glued in the center section; make sure they line up accurately. Hatches were made to accommodate individual servos for each aileron, requiring servo-extension wires and a Y-connector. For scale purposes, if you like, you could make the outlined hinged portion of the wing in the center section (this was done on the full-size airplane for easier entry into the rear cockpit). Note that the wing is built flat on the building board; it has no dihedral.

Sullivan* 5-inch Golden Age wheels are perfect for the Piet. Note the wire axle with brass tubes and washers soldered to the ends and drilled for a cotter pin to hold the wheels in place.

The outboard panels are held to the wing center section with a simple rubber-band system. Glue two 3/4-inch squares of 1/4-inch-thick plywood to the inside of the outer panel root rib. One goes just behind the main spar and the other at the front edge of the TE stock. A matching set of plywood squares is also epoxied in place on the inside of the wing center-section outer ribs. Drill a hole in the center of each of these plywood squares, then, after the wing has been covered, insert a pan-head screw into each. When the wing is assembled, a simple rubber band looped over the screws holds the panels adequately in place.

• **Covering.** Use fine sandpaper to smooth all the outer wood surfaces and round off the formers, stringers, wing LE, struts and braces. My model was covered with blue and tan Ultracote*. This material is excellent in its adherence to open and sheeted structures. It also has a lower luster, which makes it look more like full-size fabric that has been painted. Cover the bottom of the center section of the wing first, mount it on the cabane struts, and then cover the top portion. Remember to remove those sections of the Ultracote where the stab is glued to the fuselage and the fin to the stab.

The cabane and wing-lift struts and the inside of the engine compartment/cowl can be stained and then sealed with a clear coat. Though I did not install a dummy Model A Ford engine to go with the scale, the dummy engine can easily be made of balsa blocks and sheet. It's up to you how much or how little detail you add to your Piet.

Another view of the wing center section showing the bottom of the wing center section and the cabane-strut mounting notches. Note the sandwich of 1/4-inch-balsa rib between two 1/8-inch-plywood ribs.

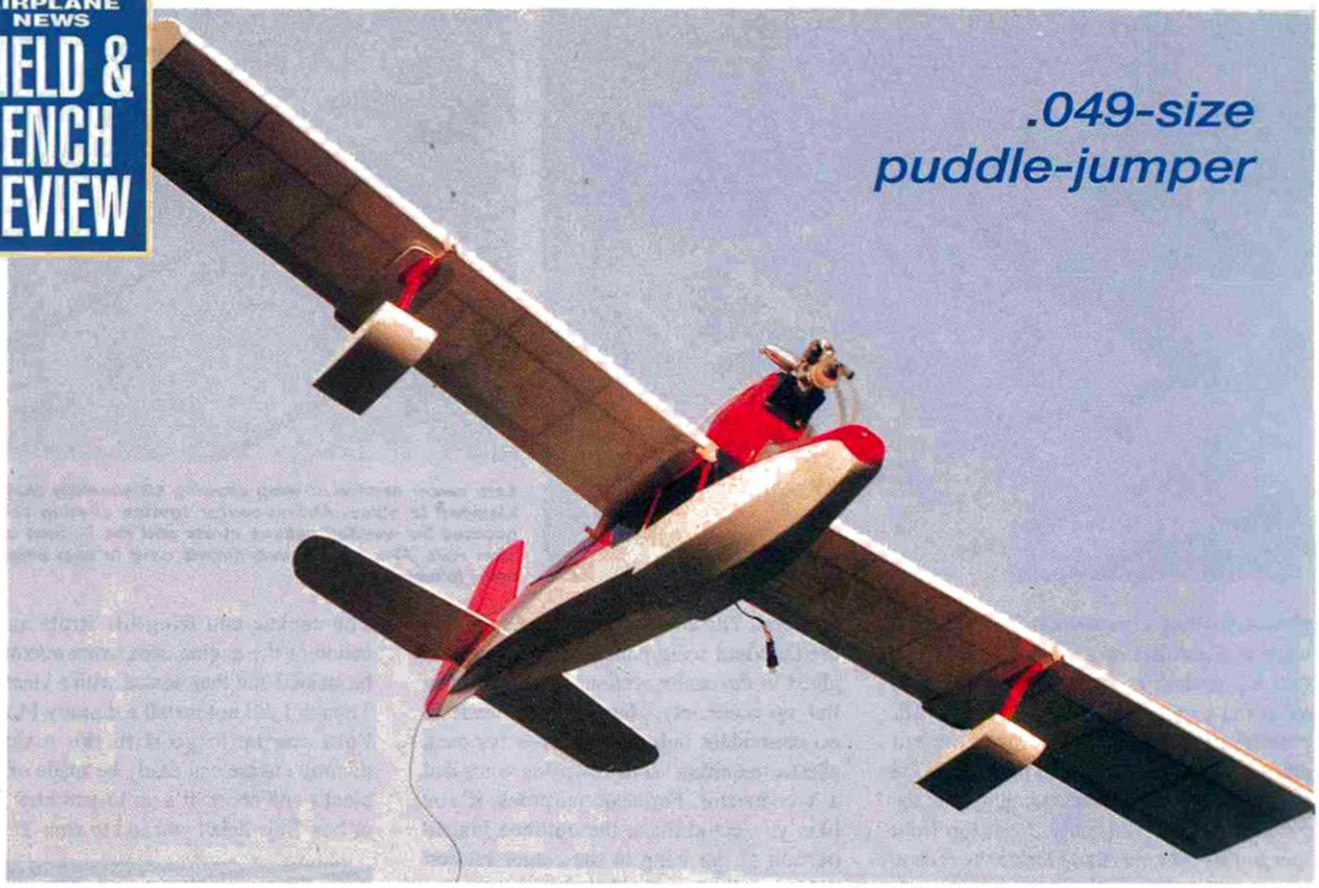
To quote John A. DeVries, columnist for *Model Aviation* magazine, "Do you get the feeling that every other giant-scale model is a J-3 Cub? Other scale subjects that have essentially the same configuration ... Pietenpols (still being built today) are stunning giant-scale projects."

If you have any questions about the construction or flying of this model, please do not hesitate to contact me at 524 Corrinthia Court, Elk Grove Village, IL 60007, or email me at: doctorc@earthlink.net.

**Addresses are listed alphabetically in the Index of Manufacturers on page 150.*

MODEL AIRPLANE NEWS

FIELD & BENCH REVIEW

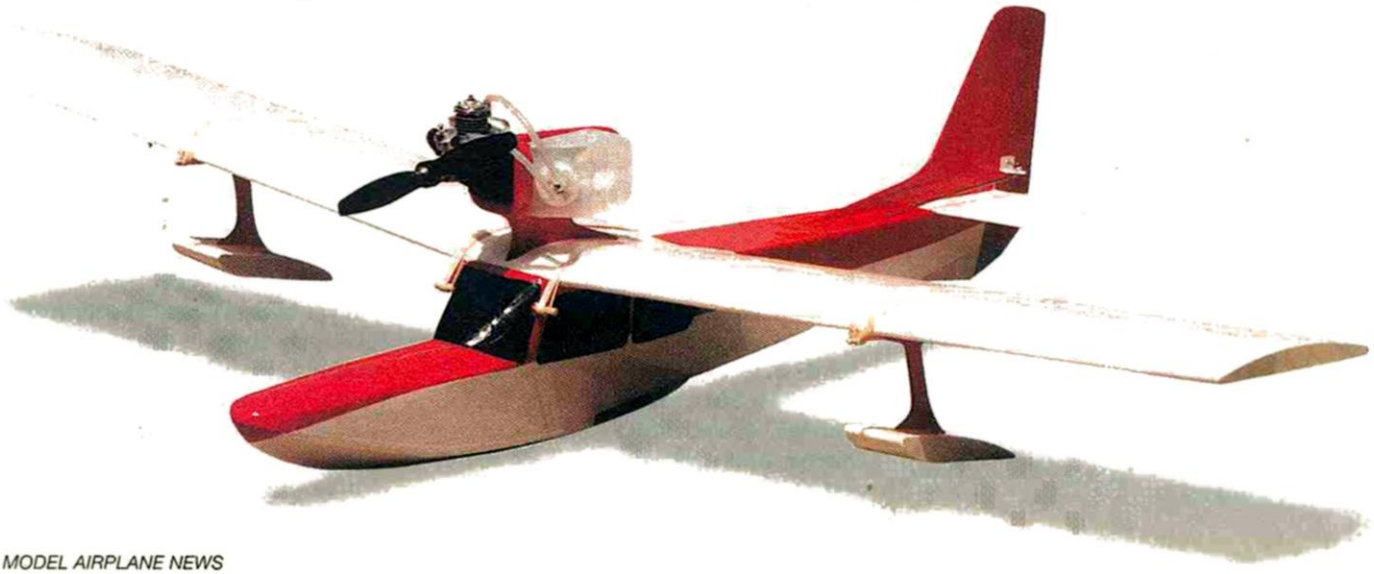


PHOTOS BY RANDY RANDOLPH

HERR ENGINEERING Aqua Star

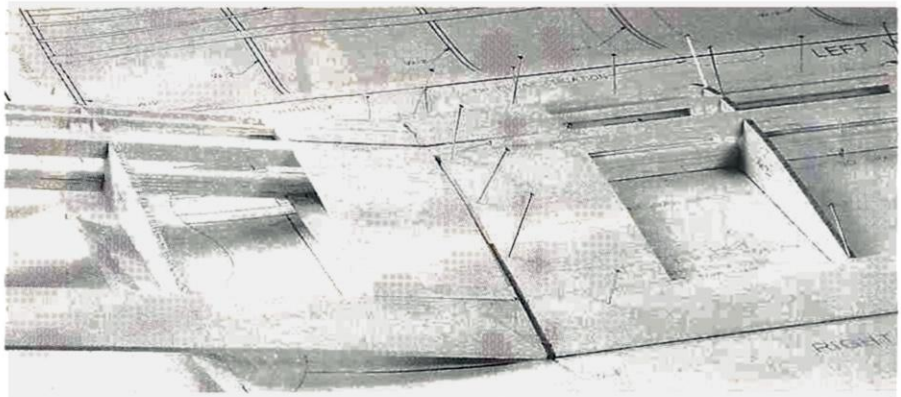
by RANDY RANDOLPH

THE HERR ENGINEERING* Aqua Star adapts itself to just about any type of flying site. It can be flown from water, grass, or snow and be perfectly at home. It is easy to hand launch and is light and strong enough to survive difficult landings. The only thing that should be avoided is repeatedly landing on pavement or gravel. If you follow the building instructions to the letter, you'll have a light, good flying model airplane. Most of the kit's laser-cut parts fall out of the sheets, and they fit smoothly and precisely.



FIRST IMPRESSIONS

Inside the box, there's an instruction manual, two sheets of rolled plans, balsa and plywood sheets and some sticks. The balsa is very pretty wood with beautiful laser-cut pieces that slip out with absolutely perfect edges. The plywood parts also come out smooth and square. A smaller package holds parts such as dowels and control horns. One plan is of the fuselage and tail group, and the other is of the wing and tip floats. The plans are well drawn and complete. The instruction manual does not have assembly pictures but it does provide clear, numbered steps. Tom Herr is a model builder, and the design shows his love for the hobby!



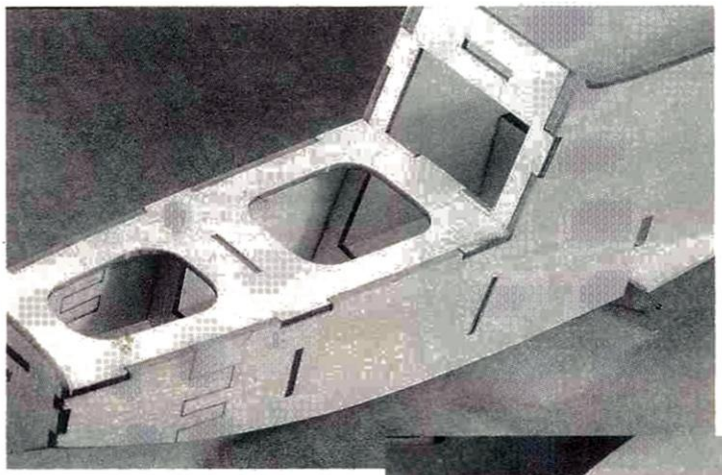
The left wing panel is built first, over the plan. Then it is placed beside the right wing while it is being built. This results in a warp-free wing with the proper slot that will accept the plywood pylon for the engine mount. Good engineering!

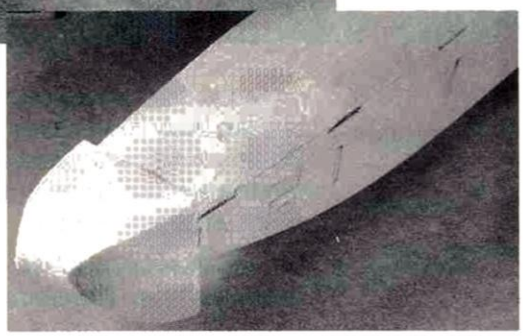
CONSTRUCTION

The very first step is to label each of the parts using the pictures of the printed sheets in the front of the manual. The parts come out of the sheets so easily that before you know it, you can have a pile of unlabeled pieces, and looking them up later can take some time. The first steps are gluing the stab, elevator and rudder. An insert in the manual explains that a few of these parts don't correspond with the manual, although looking at the plan would have cleared up any confusion. The next steps were to add extensions and doublers to the fuselage sides and glue the bulkheads into place. The tail group and basic fuselage can be finished in a couple of hours—even if you use aliphatic resin instead of CA! The parts fit together so well that you should be able to assemble each piece, wick in the glue and go to the next step almost instantly! (If you use aliphatic resin, you'll have to wait for the glue to set.) The only thing to watch for during assembly is to make right and left fuselage sides and to put the formers in right-side up!

The bottom sheeting fits very nicely into place on the formers. After the nose block has been glued to the front former, it must be carved and sanded to the proper shape. The trick is to follow the contour of the fuselage sides, top and bottom, up to the tip of the nose. When you've carved the block to the rough shape, cover the fuselage with a piece of paper and sand the block to its final shape.

The wing is of straightforward, built-up construction. The left wing is built first then pinned over the extended view of the right wing. The tip is elevated to the proper dihedral, then the right wing is built on the root of the left. This keeps the slot that will accept the engine mount correctly aligned. The wingtips are triangle-shaped balsa blocks that are carved and sanded to the airfoil contour after they have been glued into place. The first step in building the pylon that supports the engine and fuel tank is to mark and drill the firewall, which is then glued to the front of the plywood pylon. After adding the balsa fairings to each side of the pylon, I glued a balsa block to one side of the mount and installed the fuel tank on the other side. Since my engine had the fuel intake line on the opposite side from the one shown on the plan, I put the block on the right side of the pylon so I could mount the tank next to the carb intake of the engine. A Dremel tool with a sanding drum does a great job of carving the fairing block to the proper streamlined shape. I





Left: the front deck, like the aft, fits to the sides and formers and makes it almost impossible to build a fuselage that is out of line. Below: two balsa blocks finish the nose. They must be shaped then carved and sanded to shape. The block just behind the nose block is removable to access the battery.

SPECIFICATIONS

Model: Aqua Star

Type: .049-size sport floatplane

Manufacturer: Herr Engineering

Wingspan: 42½ in.

Wing area: 245 sq. in.

Weight: 20 oz.

Wing loading: 12 oz. per sq. ft.

Engine used: VA .049

Radio req'd: 3-channel

List price: $54.95

Features: laser-cut balsa and plywood parts, two rolled sheets of plans, hardware and an instruction manual.

Comments: this very attractive and easy-to-fly seaplane can be taken to the lake or field all in one piece. Flying from a grass field is just as much fun as flying from a pond or lake, and the Aqua Star really looks good in the air.

Hits

- Very good laser-cut balsa and plywood parts.
- Good instruction manual.
- Well-drawn and attractive full-size plans.
- Good hardware package.

Misses

- A pass or two with a band saw through the balsa blocks could have made shaping and carving them easier for the novice builder (I understand this has been addressed in later kits).

FLIGHT PERFORMANCE

The first flight was from the water. Because I was anxious to see how it flew, I made the first flight before installing the throttle on the engine, so it was fire it up and let it go!

• Takeoff and landing

The takeoff took about 75 to 100 feet, and tracking in the water was better than I expected. Very little rudder correction was necessary. A little forward stick to get it up on the step, and it slipped into the air as slick as a whistle. Only slight up-trim was necessary for level flight; after that, the Aqua Star performed like a trainer—gentle and smooth. Hand-launching is a cinch, and you can even use the step for a finger hold to give additional snap to the launch.

Dead-stick landings on the water were OK, but were more of a pancake than a landing. Later, when the throttle was installed and some power was carried in the glide, the landings were textbook and the taxi back to shore was really pretty! Landings on grass are smooth, and the airplane hasn't even been scratched.

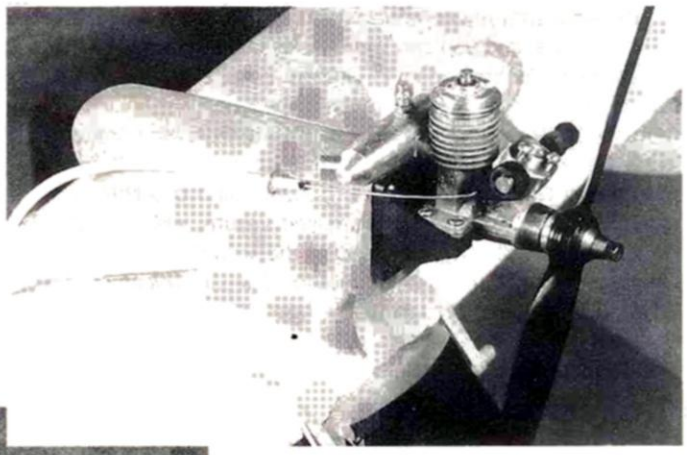
• General flight characteristics

The Aqua Star needs a little extra up-elevator and opposite rudder to hold the nose up in turns. This is typical of rudder airplanes with a rather high center of gravity and thrust line. With the outboard floats in place, aerobatics were limited to stall turns, snaps and loops from a downhill approach. Flying with the outboard floats removed offered a little more speed and sparkle. The loops were much better, and even a rather lazy transition to inverted flight is possible, although it will take all of the down-elevator to stay level. The real plus to flying the Aqua Star is how good it looks in the air.

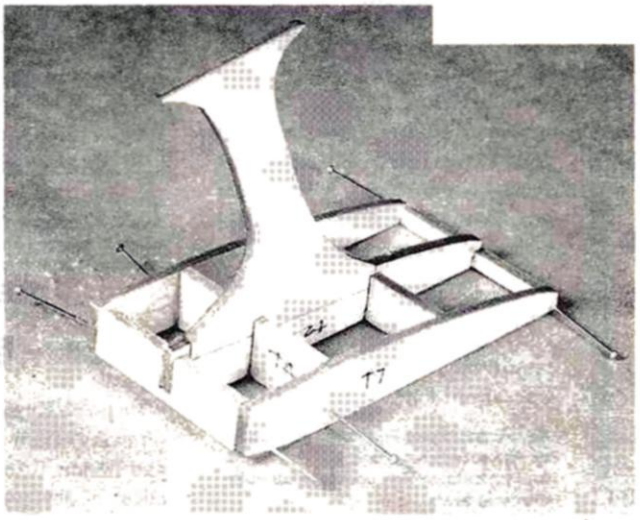
painted the engine/tank pylon with matching fuelproof paint.

I built the removable outrigger floats, covered them and then cemented them to their mounts, which I reinforced with ¼-inch-square balsa fairings. The Dremel and sanding drum did a good job shaping these fairings, too. The float mounts are held in place under the wing with rubber bands that go over the wing. They can be removed when you fly from grass. To eliminate any water problems, you should cover the model with plastic film (I used MonoKote* and Oracover*). Flying from grass has stained the bottom covering a bit, but so far, nothing has had to be replaced or repaired.

I completely covered the model before adding the throttle line, which comes through the wing and curves alongside the engine-mount fairing just aft of the engine. The outer shield is epoxied to both sides of the wing and to a U-shaped wire bracket that secures it to the mount. This shield is trimmed flush with the bottom of the wing, and the throttle servo is laid on its side and held in place with servo tape. The fuel tank is held on the opposite side of the engine mount with servo tape, and that works just fine, too! In the course of construction, I made only two changes to the plan: the windshield and the pushrod exits. I have never had much luck holding plastic windshields in place with the so-called canopy cements, so I made the windshield out of 1/16-inch balsa sheet and covered it with black plastic film to match the side windows. The pushrod exits are shown on the sides of the fuselage near the tail, and the instructions state to use only slits in the covering material to help keep water out. I moved the pushrod exits to the top of the fuselage, along with the elevator and rudder control horns, and so far, no water has entered the fuselage in this area. To get the model to balance properly, the battery must be installed in the forward part of the nose and the receiver, just aft of the battery.



Right: the throttle line is epoxied through the wing and onto a wire bracket on the pylon fairing. The tank is on the opposite side of the pylon. Below: the tip floats are of egg-carton construction and are finished with a block on the front that's blended into the top and bottom sheeting.



FINAL THOUGHTS

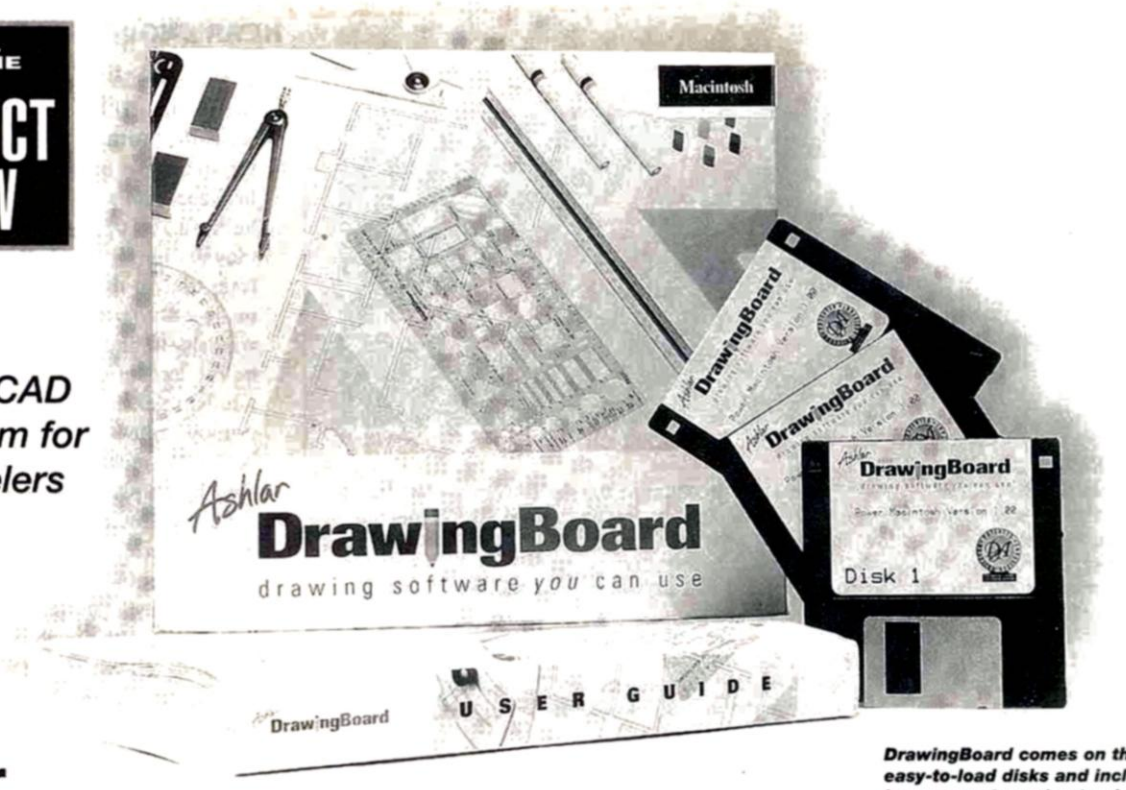
If you are fairly new to model building and would like to enjoy the satisfaction of watching an airplane grow before your eyes, the Aqua Star may be just the thing for you. On the other hand, old-timers like me will thoroughly enjoy building this airplane without the hassle of cutting out parts and then trimming them to fit as they should. The Aqua Star kit provides just enough carving and sanding to allow newcomers to get a feel for the wood without frightening them away. It takes a little longer to build because of its outrigger floats and engine-mount pylon, but it brings a lot of satisfaction when completed.

**Addresses are listed alphabetically in the Index of Manufacturers on page 150.* ✦

MODEL AIRPLANE NEWS

PRODUCT REVIEW

A 2D CAD program for modelers



DrawingBoard comes on three easy-to-load disks and includes a large, easy-to-understand manual.

Ashlar DrawingBoard

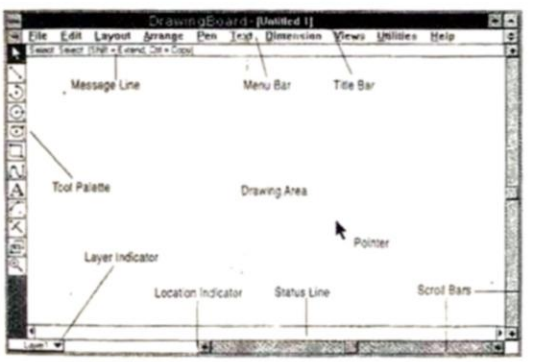
by GERRY YARRISH

FOR THE PAST TWO years or so, I have been teaching myself computer-aided design (CAD). I have always been handy with paper, pencils and rulers, but I wanted to step up and work with my computer. With a CAD drawing program, you don't need to draw anything twice, and you can very quickly make changes to those things you have drawn. Scaling plans (printing them in different sizes) becomes simple, and I now find myself in front of my computer way too much of the time.

Ashlar® promotes DrawingBoard (DB) as "drawing software *you* can use." I found it to be a powerful, easy-to-use program that you indeed spend more time drawing with than trying to figure out. DB is a 2D version of Ashlar's more powerful (and more expensive) 3D drafting program called Vellum, which is used by such people as Burt Rutan, the designer of the "around-the-world" composite aircraft, "Voyager." Ashlar has taken many of the drawing features from its Vellum program and packaged them in DrawingBoard at a fraction of the cost. With the addition of DrawingBoard Pro (see sidebar, "Import AutoCAD files using DrawingBoard Translator"), CAD becomes very user-friendly, especially for modelers.

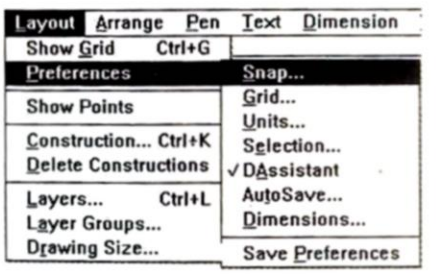
GETTING STARTED

DrawingBoard is available as a PC- and Macintosh-based program and comes on three, 3.5-inch disks. On a PC, DrawingBoard will run on any 386, 25MHz processor or better (with a math coprocessor). You need at least 8 megabytes of RAM and about 12 megs of hard-disk space for a full installation. I had no trouble loading the software onto my Mac Performa 2690 CD computer, but found that I could not run it on a Mac Quadra 605. This is because the Quadra did not have a math coprocessor utility (CPU) installed. The DB instruction book does, however, go into fine detail on the running requirements of the program, so you should have no problems installing it; just follow the "Install" directions and click away.



Here's what you see when you boot up the program: along the left is the tool palette, which contains all your drawing tools.

Since DB runs in a Mac and Windows-based format, anyone already familiar with Windows should find it easy to use. DrawingBoard's screen includes a selection of drawing tools (palettes) along the left side, and each tool has several related options in sub-palette formats. Across the top of the screen are pull-down menus that provide the many features in easy-to-use/find format.



Along the top are pull-down windows showing the various menus and sub-menus. The check mark indicates that the Drafting Assistant is activated.

FEATURES

DrawingBoard has many unique features, such as:

• **Import/Export**. DB can take a file (drawing) from a different CAD program and import it into a file with only a few clicks of the mouse. This feature is usually

found only in higher-priced programs. With DrawingBoard, you can import drawings as either Data Exchange Format (DXF), Metafiles (WMF), bitmapped (BMP), or from an ASCII text file.

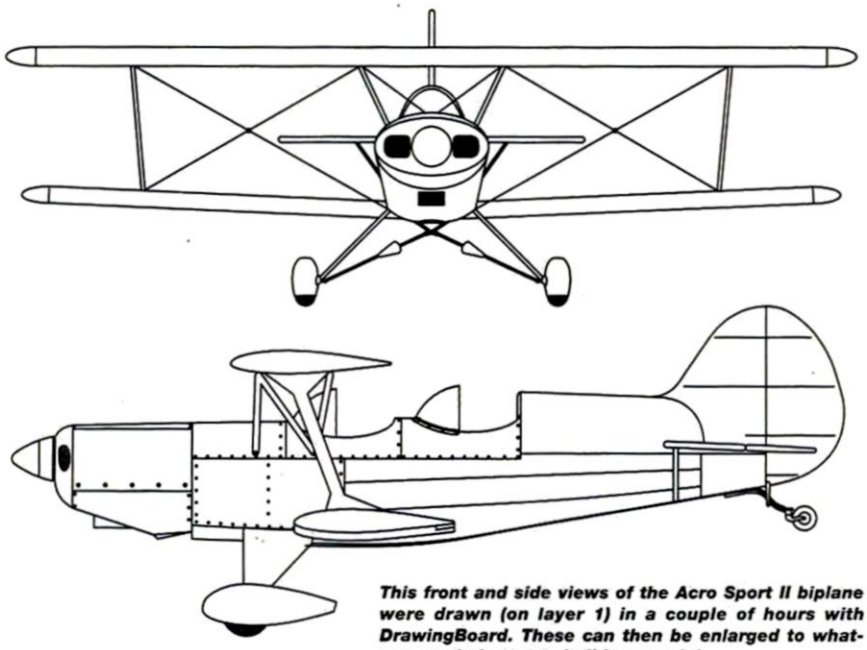
• **DXF.** This is the format used by AutoCAD and several other high-end CAD programs to transfer drawing data. Being able to import and export DXF files is very useful, as there are many sources of DXF files on the Internet. If it isn't already, DXF is becoming the standard format for exchanging CAD files.

• **BMP.** Files are also widely available, and it's the default setting for Paintbrush—the drawing program included in Microsoft Windows. Online companies such as America Online, CompuServe and JavaNet allow access to many BMP files that can be easily downloaded. In the Mac world, BMP files are formatted as PICT files.

DrawingBoard uses text files in two ways. First, you can import text (words) directly into your drawing file. You can type callouts or instructions for your latest aircraft plan using your word-processor program and then import the text into the appropriate place directly on your plans. This allows you to spellcheck and use a variety of text fonts or styles. The finished plan will have that neat and professional appearance so important to the true CAD addict.

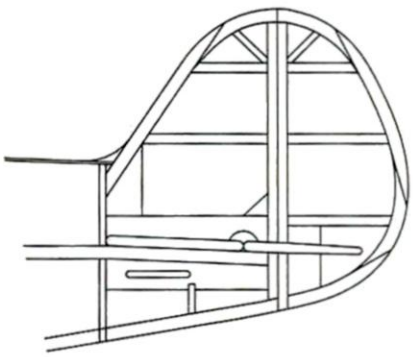
The second way in which DrawingBoard uses text files is to create complex shapes. DB can take a set of coordinates from a text file and use them to create a spline. Splines are smoothly curved lines that can be quite complex. Data for airfoil plotting is a good example of a text file that DB can convert into a spline.

To put this import/export feature into perspective, here's what you can do. First, you can take a plan or a line drawing of a plane and use a scanner to convert the image into one of the previously mentioned file formats. DrawingBoard can then import this file and "paste" it into your drawing file. You can then modify that drawing if it is a DXF file, or trace the image very accurately with the various drawing tools if it is BMP or PICT. When you've finished, you can print out your plan (or any part of it) in any size you wish. Neat!



This front and side views of the Acro Sport II biplane were drawn (on layer 1) in a couple of hours with DrawingBoard. These can then be enlarged to whatever scale I want to build my model.

In the tool palette, there are many drawing tools at your disposal: your typical line, circle and square drawing tools, as well as those for arcs and ellipses. There are various trimming tools for removing (cutting) unwanted line segments, and there are tools to modify and adjust the object you've drawn. You can create a mirror image of an object and rotate it to a new position, or you can enlarge, reduce, or duplicate a selected object. All the tools are adjustable, and by simply typing in a specific length, diameter, or radius dimension, you can draw whatever you want.



This close-up of the Acro Sport II's tail was drawn on layer 2 and includes all the model structure detail. Drawing different segments of your plans, such as engines, dimensional callouts and hardware, on different layers is an excellent way to keep your drawings neat and uncluttered.

SPECIFICATIONS

Manufacturer: Ashlar

Product: DrawingBoard

Distributor: CADTRON

Program type: Windows-based 2D computer-assisted-drafting

Memory requirements: 8MB RAM and 12MB of hard-disk space

Versions available: PC and Macintosh/Power Macintosh

Price: $175; $199.95—DrawingBoard w/AutoCAD DWG Translator (DrawingBoard Pro); $99—DWG translator available separately.

Features: DrawingBoard includes a 300-plus-page instruction manual and three installation disks. Program features include Tool Box, Drafting Assistant, Normal and Variable Parametric control, Smart Wall and import capabilities for BMP, WMF, DXF, or ASCII text files.

Comments: Program requirements

- PC platform—DrawingBoard runs on any 386, 25MHz processor or better (with a math co-processor). It requires 8MB of RAM and 12MB free hard-disk space for a full installation. DB runs on Windows 3.x and Windows '95/NT. (A 486, 33Mhz processor or better is recommended.)
- Macintosh/Power Macintosh platform—DB runs on any Mac II (with a math coprocessor) or better. It requires 8MB of RAM and 12MB free hard-disk space. Both versions of DB run on System 7.0 or later. The Power Macintosh version of DB runs on any 6100 system or better. A 68030 processor (with a math co-processor) or better is recommended for the Macintosh version of DB.
- Check CADTRON's website for more information at www.cadtronweb.com.

Hits

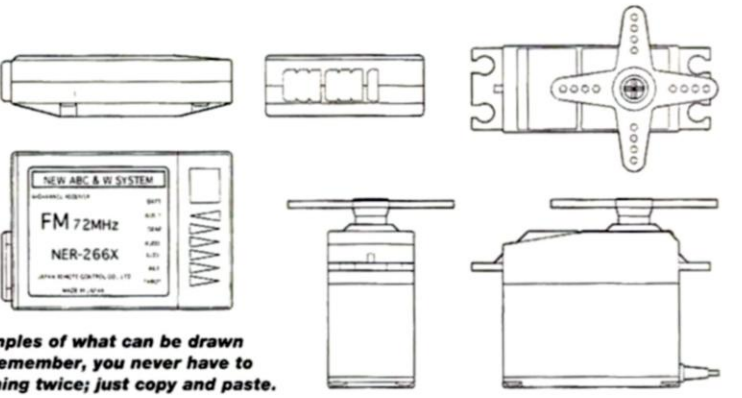
- Easy to use.
- Has powerful features usually found in more expensive CAD programs.
- Good instruction manual.
- Able to import graphic files from other programs.

Misses

- Won't work on computers that don't have a math coprocessor utility (CPU), but most newer computers come with CPU installed.

DRAFTING ASSISTANT

The Drafting Assistant (DA) application, as the name implies, helps you draw your plans. DA aligns the various elements in your drawing with one another. It automatically indicates common reference points, such as circle or arc center points, intersect and tangent points of a circle, center points and perpendicular intersections on lines. DA allows you to connect lines, or segments of lines, easily and effortlessly. With DA activated, line endpoints or circle center points "snap" into position when you drag them close to where you want them. In my opinion, DA is the most important difference between DrawingBoard and all the other CAD programs.



Some examples of what can be drawn with DB. Remember, you never have to draw anything twice; just copy and paste.

PARAMETRICS

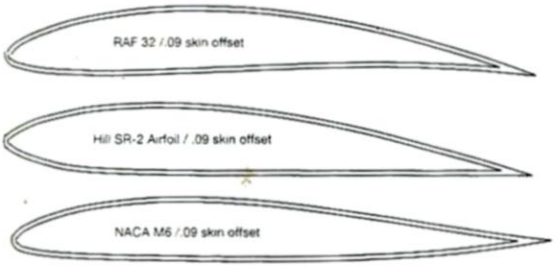
Parametric control is a way of constructing geometric shapes that can be automatically redrawn with measurements and angles you specify. DB has two types of parametrics: normal and variable.

With normal parametrics, you draw the shape, and you use the editing tools to specify the lengths and angles needed to accurately reshape the object. Basically, you draw a rough sketch of an object (circle, square, rectangle) and then specify the dimensions.

Variable parametrics allow you to specify a variable line length or angle so that you can create shapes based on geometric formulas. Using the variable parametric function, you create a symbol (or template) for an object and then specify its specific size and angles when used. Once the data has been entered, DrawingBoard creates the object to your specifications. Many variable parametric templates are already supplied for you in the DB Symbol file. Items such as nuts, bolts, screw heads, washers and screw side views can be selected and then drawn to your specification (diameter, length or width) by simply entering the data and clicking the mouse.

The DrawingBoard manual is more than 300 pages long, and it is very well written. Chapters include all the information you need to start drawing right away. I found the tutorial chapter a good place to start. It runs through the tasks of drawing an object and tells you which tools to use and when. As you improve your skills, you will soon develop your own style and use of the available tools. When you want to print or plot out your finished plan, the instructions are clear and help you set up the requirements for various plotters and printers.

At home with a standard desktop printer, you must "tile" print your design and tape the various pages together to form the complete plan. This is good for the guy



These airfoils were drawn with the DB program after I had imported the coordinates for each with a "text only" (ASCII) file. For DB, you need to arrange the airfoil data in three vertical columns: the first is for the chordwise-percentage data, the second is for the top spline and the third is for the bottom-spline data. To draw the entire airfoil, you must swap the data in the second and third columns and import the file twice.

CAD on the Web

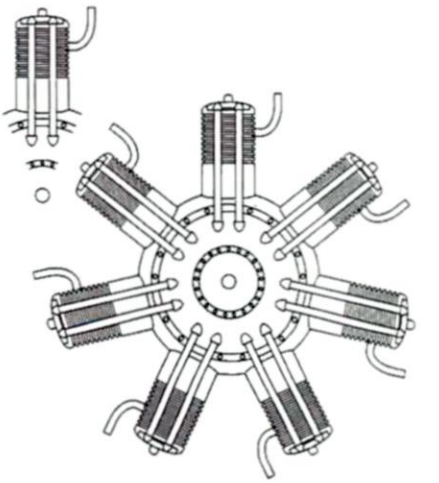
Once you have a CAD system capable of importing files, you're going to want to find sources for DXF and PICT (or bitmapped) drawings. Here are a few websites I've found that I think you will like.

- **StarCad Plans** www.azstarnet.com/~stcad/index3.htm.
This great CAD-plan site is run by Guy Fuller. Guy has collected many model airplane plans and offers them free for download in DXF and VLM (DB's internal language) formats. Check out my CAD Kaos plan when you're there.

- **UIUC Airfoil Data Site** http://amber.aae.uiuc.edu/~m-selig/ads.html
This site contains over 1,100 airfoil data files. Overseen by Michael S. Selig, on this site you can download airfoil coordinates. Also linked to the UIUC Applied Aerodynamics Group, Department of Aeronautical and Astronautical Engineering, University of Illinois at Urbana-Champaign, Urbana, IL.

- **Eduardo's 3-view Homepage** http://www.angelfire.com/me/eduardospage/
This site contains 196 low-resolution, 3-view aircraft drawings in bitmap format suitable for making your own plans. The list of planes covers the alphabet from the Airacobra and Avenger to the Macchi-202 and ends with the Japanese Zero. You get the idea.

- **NASA Dryden Flight Research Center Graphics Gallery**
http://www.dfrc.nasa.gov/gallery/graphics/index.html
This gallery contains digitized drawings, graphics and line art (current content is 145 images) of many unique research aircraft flown at what is now known as NASA Dryden Flight Research Center at Edwards, CA. No copyright protection is asserted for these images. Multiple formats are provided, including EPS (encapsulated postscript) and two GIF files (one high and one low resolution).

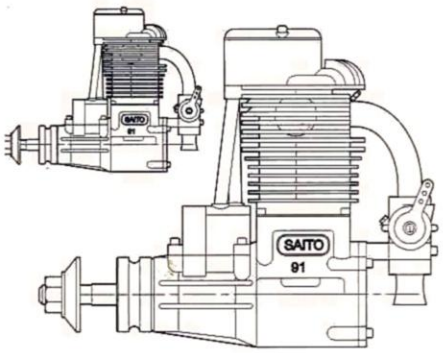


Radial duplication of objects is also one of the many useful features in DB. I first drew the single cylinder at the top left, then I told the program I wanted seven duplicates arranged in a 360-degree circle. After I had selected the center point, DB drew this great looking Yarrish radial engine. A 5- or 9-cylinder engine is just as easy to draw.

Import AutoCAD files using DrawingBoard Translator

AutoCAD is one of the granddaddies of the CAD world, and there is a large installed base of this software in the business and engineering communities. With so many people using it, there is often a need to be able to import files from AutoCAD into the CAD system being used. DXF transfer formats are generally used for this, but they suffer from difficulties in handling multiple layers, fonts, colors, etc., across hardware and software platforms.

The new DrawingBoard Translator solves the problem of AutoCAD file importation by directly importing AutoCAD DWG files, and it works great. When installed, the translator simply places an AutoCAD option on the import/export menu, and you operate it from there. This software comes with DrawingBoard Pro and is available to DrawingBoard (PC version) users separately for $99.



Resizing objects, such as an engine or a servo, is very simple. Just highlight the object, select an anchor point, then select the start and end points. To resize an object to a specific size (like a wingspan), first draw a line to the length required, and then use this line to locate your start and end points.

who is ready to start building right away. Formers can be grouped and printed separately from the top and side views. If you're thinking about selling your plans, then you can save your file in a DXF format and load it onto a disk. Take the disk to a local printer who can print a full-size plan for you. You are now ready to make a killing in the model airplane plans market!

DrawingBoard is one of the easiest CAD programs I've used, and it doesn't cost a lot when you consider all the utility it provides. If you've ever wanted to try a drafting program but were afraid you weren't up to the task, then I think you'll like Ashlar's DrawingBoard. Give it a try.

**Addresses are listed alphabetically in the Index of Manufacturers on page 150.*

MODEL AIRPLANE NEWS

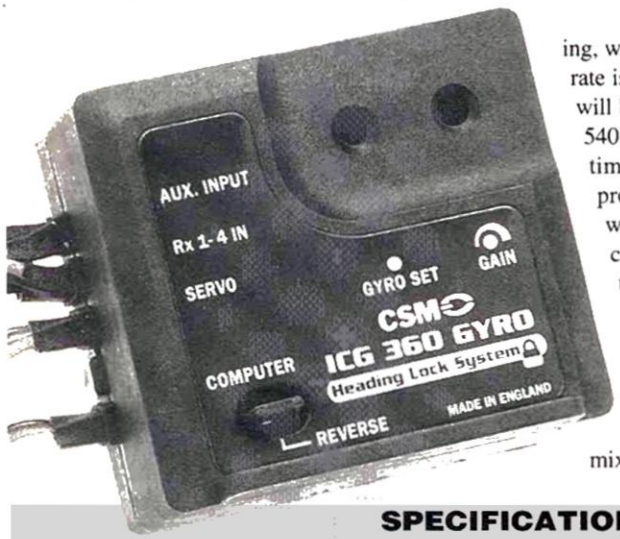
PRODUCT REVIEW

"THIS NEW PIEZO gyro keeps you headed in the right direction" is quite a claim. I thought so too, until I flew with one. There have been many advancements in model helicopters over the past few years. First, there was the mechanical gyro; then, computer radios that were capable of creating tail rotor pitch curves (much like main rotor pitch curves). Solid-state piezo gyros are now in vogue, so it's only natural that gyro technology has advanced. With the new CSM* ICG 360 piezo gyro and its revolutionary new heading-lock feature, anyone—from beginners just learning to hover to 3D veterans—can have a rock-solid tail rotor. With the gyro heading lock activated, the helicopter's heading will not change—whether it's flying forward, backward, or sideways.

CSM ICG 360 Piezo Gyro

by RICK BELL

Superior helicopter control



GYRO 101

To understand how the CSM gyro works, it's necessary to understand how a standard gyro works. As the heli hovers and flies, the gyro tries to resist any tail movements. The gyro does not differentiate between pilot commands, torque, or wind, and tries to oppose these movements. To achieve a desired yaw rate, you adjust the gyro's gain. The more gain (resistance), the slower the yaw rate. That's why most gyros have two gains: one rate (high) is usually used for hovering and scale flying, where a solid tail is desired; the lower rate is used for aerobatics so the yaw rate will be quicker. Here's an example for a 540 stall turn (where the heli spins 1½ times at the top of a stall turn). The problem with a low gain rate is that when torque values change (that is, collective pitch changes), the tail tends to yaw. This makes aerobatics difficult, as you are always working the tail to keep your heading. To help counter this, most computer radios have some type of mixing capabilities. The pilot can mix in tail rotor pitch values to counter torque changes as the main rotor changes pitch. This can be time-consuming and difficult, as there are many factors involved. The CSM gyro's "yaw rate demand" and "heading-lock" features do away with all of this. As tail inputs are given, the gyro senses the yaw rate desired and moves the tail as desired instead of opposing it. In simple terms, the more the stick is moved, the greater the yaw rate. Because of the "yaw rate demand" feature, the CSM gyro is able to use yaw rate—even at high gain settings. With the "head lock" activated, the resistance to yaw is even greater, but the desired yaw rate is still achieved. The head-lock mode senses any unwanted changes in heading (tail position) and returns the heli to its heading. This system eliminates the need for any type of mixing (which is not recommended, as it will confuse the gyro).

INSTALLATION AND SETUP

The CSM gyro is designed to work with Futaba and JR systems, and installing the gyro is straightforward. First remove all program mixing that affects the rudder channel, and center the rudder trim (also center the sub-trim if it's used). The gyro should be mounted using the supplied mounting tape to isolate it from vibration. Three of the four leads from the gyro need to be connected: "Rx 1-4 IN" to the rudder channel; "Aux Input" to the auxiliary channel (this is for head-lock activation); and "Servo" to the rudder servo. The "Computer" lead is left alone. Note that if the radio system does not have an auxiliary channel, the "Aux" lead is not used, and the gyro will default to mode 0 (standard-rate mode) and react as a normal gyro. To get the best performance from this or any other gyro, the tail system must be slop-free and non-binding. Also, a fast, high-torque servo should be used. Once the connections have been made, turn on the system (transmitter first) to check for proper compensation. Common to piezo gyros is the fact that they must not be disturbed for a few seconds so they may perform self-checks. For the CSM, this takes about 7 seconds. The servo will move to its center when it's finished. To do the compensation check, pick up the heli, rotate it to the left and see if the servo inputs the right command. If it doesn't, remove the reversing link and repeat the check. Now the fun stuff starts.

Use the ATVs to adjust the gain for the tail (rudder) and the auxiliary channel. That's right, the ATVs! I started at 50 percent for both channels. Turn on the system and see what the rudder servo does. If it stays centered, the gyro is in mode 0

SPECIFICATIONS

Manufacturer: CSM Intelligent Technology

Weight: 40gm (1.4 oz.)

Dimensions: 42.5mm (1 11/16 in.) high; 26.5mm (1 1/16 in.) wide; 6.5mm (9/32 in.) long

Power supply: 3.5 to 7.2 volts

Current draw: 40mAh

Features: yaw rate demand; heading lock; two flight modes (mode 0 and mode 1); built-in exponential; anti-drift temperature calibration; two-stage power-supply regulation; flight mode tailoring via optional PC interface cable/software (the software was not available to me, so I can't comment on it).

List price: $299.95

Comments: state-of-the-art helicopter piezo-gyro system that features new heading-lock technology. True yaw rate demand philosophy that distinguishes between pilot input and external forces. Gyro has a broad range of applications from the beginner to the 3D expert.

Hits
- Easy installation.
- Easy setup.
- Clear instructions.
- Excellent precision and performance.
- Expert setup tips.

Misses
- None.

(standard rate); if the servo drifts to one side of its travel (the servo will not bind, as it is limited by the electronic limit set by the gyro), it's in mode 1 (head lock). Flip the auxiliary switch a few times to determine which switch position is mode 0 and which is mode 1. Now set the gyro to head-lock mode and if your radio has rudder sub-trim, use it to stop the servo movement (if not, use the trim pot). You are trying to stop any servo movement when switching between modes.

Initial flight trimming is done in head-lock mode. Hover the heli and watch which way the tail drifts. You use the rudder sub-trim to adjust the heli until it hovers without corrections. You can also adjust the gain now for head lock. With this done, flip the switch to normal and see whether the tail drifts. If it does, make adjustments to the tail rotor linkage, not to the electronic trims you just set. After the initial settings, you can use the rudder ATV, dual rates and exponential to tailor control response to your liking. Some good advice: before turning on head lock in forward flight, take the heli up a few mistakes high and get used to the way you must fly through turns. You must fly the tail! Remember that the gyro will hold the last heading and will compensate.

FLYING

When I got used to the gyro's characteristics, it was time to have some fun. First, I did some hovering pirouettes ... very smooth. I tried full-stick pirouettes, and the heli was a blur. I let go of the command, and the heli stopped, like, right now! Then I did some 540s. The gyro stops rotation the instant you release the stick. Sideways flight—wow!—no rudder inputs needed. Backward flight was the same. This was totally awesome! Loops and rolls were effortless. No matter what I did, the gyro held the heading with a vise-like grip. A crosswind was no match for the gyro while hovering; just pick your heading, and the gyro does the rest.

SUMMARY

This gyro is quite a piece of technology. The tail is one of the most difficult aspects of helicopters to control—not anymore, though, thanks to the CSM ICG 360 gyro. Although the setup sounds complicated, it's really very simple. The instructions are very thorough and easy to understand. There's also a section in the instructions on maximizing performance. Want to look like an expert? Look no further than the CSM gyro.

**Addresses are listed alphabetically in the Index of Manufacturers on page 150.*

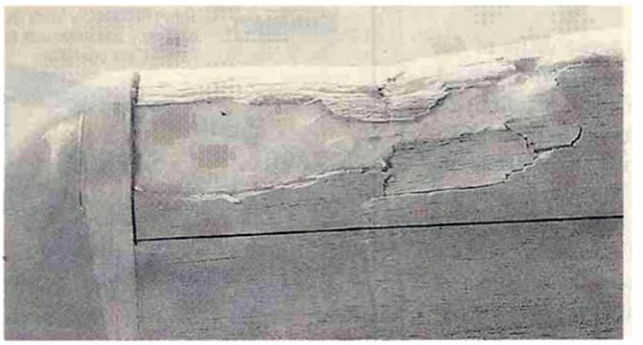
MODEL AIRPLANE NEWS **HOW TO**

A nearly invisible fix

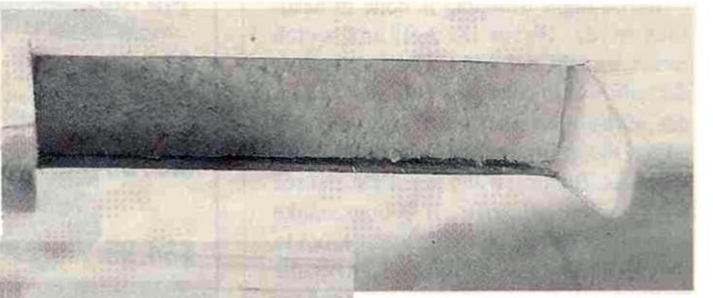
Repair a Foam Wing

by JOHN KAUK

DURING A RECENT flying session, a dead-stick stall and subsequent crash damaged the foam wing on an ARF model. The damage wasn't structurally severe, but it was bad enough to prevent the plane from flying until the wing was repaired or replaced. I thought I'd give the less expensive option a try. The following photos detail the steps I took to repair one of the three damaged areas. More severe damage, where the structural integrity of the wing is compromised, may require a different technique to repair safely and properly.

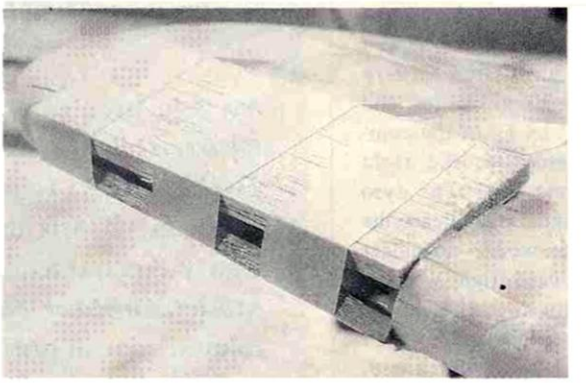


1 Here's a closeup of the damaged area. The balsa leading edge (LE) has been crushed, and the damage extends back into the foam-core and balsa top and bottom sheeting. The area to be removed is marked. Be sure to remove all of the damaged material and make square cuts in the wing to simplify the cutting and fitting of the replacement pieces.

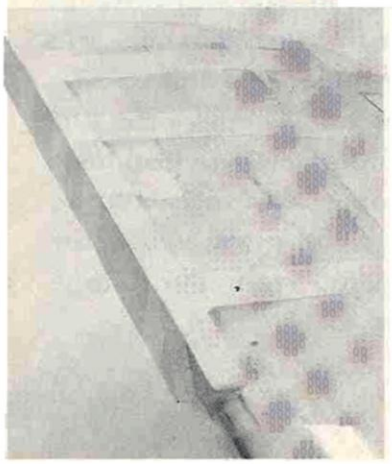


2 The damaged material and some of the foam-core have been removed so a replacement piece of foam can be fitted into the cavity. I happened to have some scraps around the shop after a recent project. Just about any kind of foam will work for small areas like this.

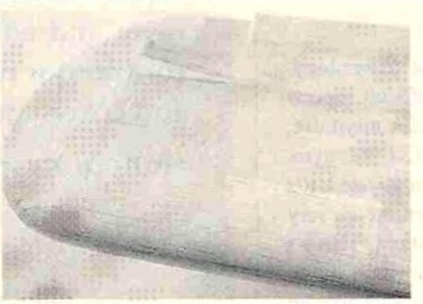
3 Fit a piece of foam into the recessed area and secure it with odorless CA. Make sure the CA is foam-friendly; I've successfully used Bob Smith* CAs for a long time. Bevel the foam filler piece and the top and bottom sheeting with a sanding block so the foam blends smoothly into the wing surface.



4 Here, 3/16-inch balsa sheet has been fitted into the cutout area. Using a razor plane and sanding block to shape the thicker replacement sheeting allows you to more easily match the original airfoil. Use a glue that sands well, such as Pica* Gluit, so the seams won't leave hard spots that may show through the covering.



5 Cut off the damaged part of the LE in a straight line, extending the cut a few inches farther back than the area that has already been repaired. In its place, fit a piece of balsa that matches the hardness of the original and is oversize so it can be trimmed to shape. In this photo, the replacement LE has been glued and taped into place.



6 Rough-shape the repairs using a razor plane and a coarse sanding block. Fill any gaps or depressions with lightweight spackle. Sand the repairs with a fine sanding block so they match the original airfoil and LE shapes.

As you can see, the area is ready to be covered with film. Since this plane was originally covered with Goldberg Ultracote, it will be easy to match the color for a practically invisible repair.*

**Addresses are listed alphabetically in the Index of Manufacturers on page 150.*

PHOTOS BY JOHN KAUK

by DAVE GIERKE

NELSON QUARTER .40

WHEN I REVIEW a high-performance, 2-stroke racing engine, my excitement and enthusiasm levels soar, as was the case when the latest version of the Nelson Q-40 arrived from Nelson Competition Engines*.

When I began R/C pylon racing in the late '60s, stock K&B, Super Tigre and O.S. engines weren't competitive; specialists reworked them for the serious competitors who demanded maximum power. For a modest fee, George Aldrich, Clarence Lee, Terry Prather, Cliff Telford and others provided racers with hand-massaged examples of these popular production engines. When viewed from the perspective of the '60s, today's racing engines represent a major paradigm shift. Today, the name of the game is "Buy it and fly it." Much of this progress can be attributed to the vision of one man—Henry Nelson—and his revolutionary, limited production, maximum-performance engines.

Henry Nelson's introduction to the world of model engine manufacturing came about indirectly as the result of his membership of our world control-line team in 1974. Nelson explained, "In May, before the world championships, I asked Westinghouse, my employer, for a leave of absence. They said no; model airplanes didn't [meet the criteria], so I quit." With nuclear engineering a thing of the past, Henry needed something to do. He continued, "After returning from Czechoslovakia, since I didn't have a job, I decided to try [engine development] work for a while ... it turned into the team-race diesel." For several years, Henry's racing diesels (.15ci) received worldwide acclaim for their outstanding design, materials, workmanship and performance—reasons why his engines are valued today.

Nelson acquired a devoted following of modelers who depended on him for their power. Eventually, he recognized that a niche market existed for limited-production, high-performance racing engines of many types. Since large engine manufacturers aren't geared for production runs of 200 or fewer, they've been reluctant to commit the time and appropriate the equipment and effort required to compete against Henry's engines, which are characterized by hand labor and testing by very skilled individuals.

In an interview with Nelson several years ago, he discussed why quality and performance cost more. "First of all, [we have] lower production numbers. Anything you compare it to has higher production and, sometimes, cheaper labor. In some cases, we use more expensive components, such as investment castings. The CNC equipment we use is versatile, but it's slower to operate than single-purpose machinery, which could be used for running far more parts. We apply more hand labor; I don't see how you can reach [our] level of quality without using hand labor. We also test-run all of the engines extensively; most manufacturers don't run them at all. All of these items are part of the total package that reflects the price."

The rules for pylon racing appear in the AMA "Official Model Aircraft Regulations" book. Engines used for the Quarter .40 event must have a front intake and side exhaust; they must be equipped with a muffler supplied by the engine manufacturer. Other than a few limiting specifications such as fuel, propeller type, carburetor bore and muffler dimensions, everything else is left to the imagination of the designer.

ENGINE DESCRIPTION AND CONSTRUCTION

The AAC (aluminum piston, aluminum sleeve, chrome-plated) system represents the engine's key sub-assembly. The piston is a silicon-aluminum alloy; besides being lightweight and tough, its temperature-induced expansion rate is less than that of other common aluminum alloys. This allows it to expand at about the same rate as the sleeve, which operates at a lower temperature, because it cools better. The cylinder sleeve is lightweight aluminum (12.9gm); the arrangement of ports is conventional: two Schnuerle and a single-boost transfer, coupled with a single exhaust. It is then chrome-plated and honed to fit precisely with a selected piston.

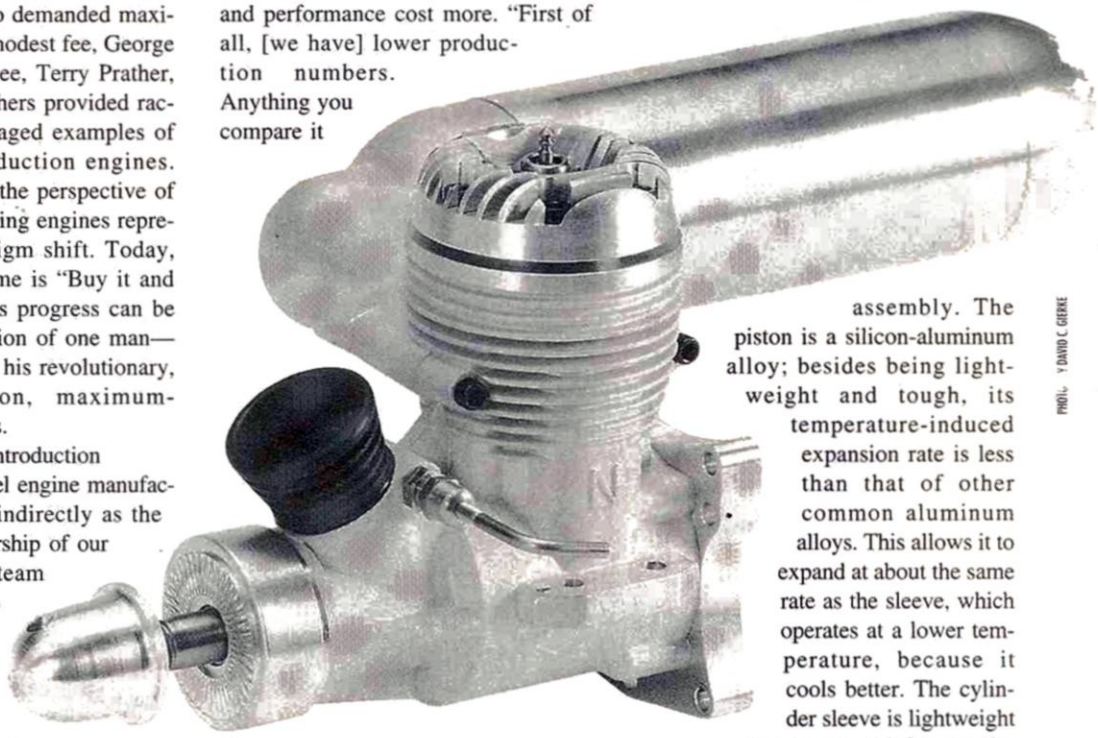


PHOTO BY DAVID C. GIERKE

Construction of the Quarter .40 follows the typical Nelson formula: investment-cast crankcase, bar-stock aluminum-alloy cylinder head consisting of a "double bubble" combustion-chamber surrounded by a wide squish band. The connecting rod, rear cover and drive washer are also bar-stock alu-

minum alloy. The crankshaft is a single piece of alloy steel, which is case-hardened and centerless-ground to a fine finish; it's supported by two precision ball-bearings.

The cylinder sleeve features a large, eyebrow-shaped exhaust port. When compared to conventional designs, this curved top edge allows for better piston support throughout its reciprocating travel—with minimum side-thrust induced tilt. However, port-open time and area requirements are fastidiously maintained for operation up to 30,000rpm. Although machine setup is more difficult, eyebrow porting adds longevity to the piston/cylinder-sleeve set.

Rather than simply blind-boring the shaft's axial passageway, its front end is made to form a smooth, angular transition with the front edge of the radial port. Without a doubt, this smooth transfer of air/fuel mixture through the crankshaft improves the engine's ability to transfer air/fuel mixture from the carburetor to the combustion chamber (delivery ratio). Machining this variation adds several tricky additional steps to an already complicated crankshaft machining procedure.

Nelson's design philosophy concerning the piston/cylinder-sleeve fit takes into consideration the extremely complicated dynamic forces associated with 2-stroke-cycle operation. Some of these factors include:

- Cool air/fuel mixture entering the cylinder sleeve on one or more sides of the piston with hot exhaust gasses exiting the other; unequal piston expansion and distortion is probable.
- Cylinder-sleeve temperatures are greater above the ports, where combustion occurs. The cylinder-sleeve expands more at the top than at the bottom, affecting the wear pattern between it and the piston.
- As the piston is being pushed away from the cylinder head by expanding high-pressure gasses, the connecting rod forms an angle with the cylinder centerline. This produces a vectored side thrust that can distort the piston/cylinder-sleeve interface. This side load isn't nearly as great on the opposite wall for the return stroke because the force is minimal.
- If cylinder cooling is uneven, the aluminum alloy case can distort the cylinder sleeve.

Nelson readily admits that no one has a handle on these dynamic interactive forces. He suggests, however, that many years of empirical testing have identified factors that improve the operational environment of the piston/cylinder-sleeve assembly; e.g., most modern engine designs use the "drop-in" sleeve concept, which cuts production costs and increases engine power.

The Q-40 has the loosest fitting sleeve-to-cylinder that I have witnessed to date. It will literally fall into place when properly aligned at the top of a dry cylinder casting. For all practical purposes, the chromed aluminum-alloy sleeve is held only by its flange ring, which is clamped in place by the cylinder head. Final engine tuning required a 0.009-inch brass shim under this ring, effectively raising all sleeve ports, allowing them to open sooner, close later and increase their total duration. This floating arrangement is designed to allow previously described dynamic forces to interact, while providing space to "give." Along these same lines, the cylinder is tapered from top to bottom (small to large) in conventional but exaggerated fashion (0.005 inch), with an interference fit between the piston and sleeve at TDC (top dead center).

My only concern with the loose fit between the sleeve and cylinder was the potential

ENGINE SPECIFICATIONS

Cylinder displacement	0.396ci, 6.49cc
Bore	0.8465 in., 21.5mm
Stroke	0.7045 in., 17.89mm
Bore/stroke	1.2/1
Stroke/bore	0.83/1
Conrod length (ctr. to ctr.)	1.337 in., 33.96mm
Conrod/stroke	1.9/1
Combustion chamber volume @ TDC	0.44ml
Compression ratio—geometric	15.75/1
Compression ratio—effective	8.26/1
Carburetor bore	0.354 in., 9.0mm
Crankshaft thread	5/16 x 24
Weight (bare)	11.875 oz., 336.7gm
Weight (with muffler)	15.75 oz., 446.3gm
Cylinder taper (TDC to sleeve bottom)	0.005 in.
Exhaust port opens	80° ATDC
Exhaust port closes	80° BTDC
Exhaust duration	200°
Transfer port opens	66° BBDC
Transfer port closes	66° ABDC
Transfer duration	132°
Boost port opens	66° BBDC
Boost port closes	66° ABDC
Boost port duration	132°
Induction opens	34° ABDC
Induction closes	60° ATDC
Induction duration	206°
Crankcase compression (primary)	54°
Exhaust lead	34°
Height (overall)	3.625 in.
Height (from crankshaft centerline)	2.635 in.
Width (at lugs)	2 in.
Width (at crankcase)	1.375 in.
Length (to prop driver)	3.3125 in.
Mounting holes (beam, side to side)	1.625 in.
Mounting holes (front to back)	0.594 in.
Maximum torque	104 @ 26,500rpm
Maximum b.hp	3.05 @ 29,000rpm
B.hp/cubic inch	7.7
B.hp/pound	3.1
Oz.-in./ci	263
Oz.-in./lb.	106
Maximum rpm (suggested)	None
Best rpm range	27,000 to 31,000
dBA	None recorded
Fuel	15% nitromethane, 20% oil (1/3 Klotz KL 200, 2/3 Klotz Benol castor), 75% methanol
Atmospheric test conditions	70° F 29.47 in. (not corrected) 65° F (wet bulb)
List price	$325

Features: silicon-aluminum alloy piston; lightweight chrome-plated aluminum cylinder sleeve; investment-cast crankcase; bar-stock aluminum-alloy cylinder head, connecting rod, rear cover and drive washer. The crankshaft is a single piece of alloy steel and is supported by two precision ball bearings.

Comments: proof of the Nelson Quarter .40's effectiveness is reflected by the 1997 AMA Nationals results: the first eight places used Nelson Q-40s—16 of the top 20. The winner, Richard Verano, turned a time of 1:04.85—faster than the winning time for the elite Formula 1 event!

Hits
- Leading-edge design for 2-stroke-cycle engines.
- Constructed of the best materials.
- Exquisite machine work.
- Each engine is extensively tested to a uniform standard of performance before it leaves the factory.

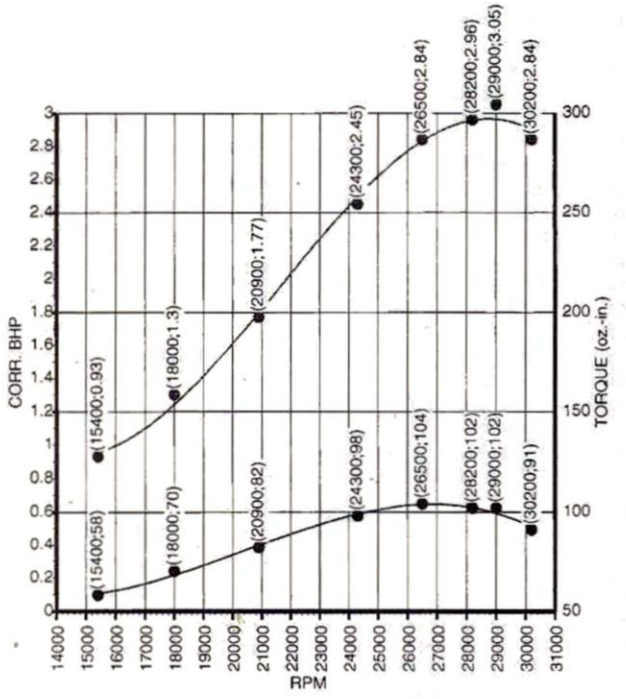
Misses
- None.

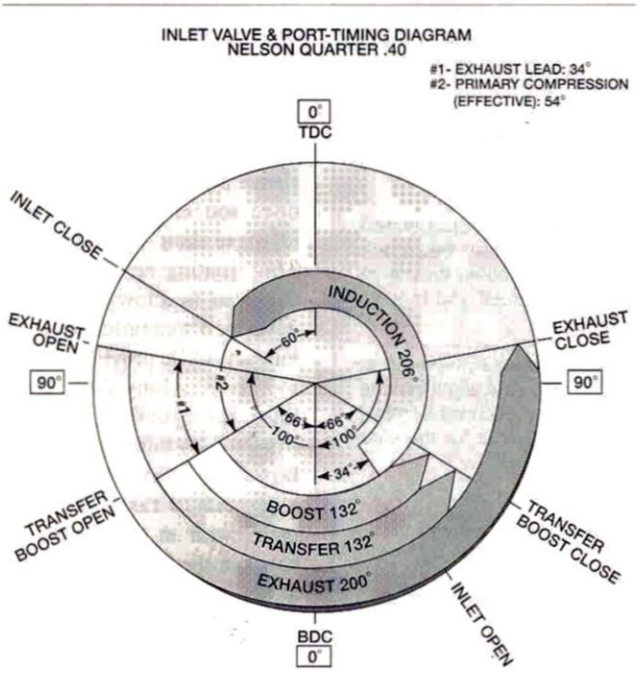
for leaking fresh air/fuel mixture from the crankcase out the exhaust. Theoretically, this charge-diminishing process could occur during primary compression—between the crankshaft induction port closure and cylinder-sleeve transfer-port opening. The engine's tuned-exhaust system offers its own dynamic interactions, which probably serve to reduce these effects, i.e., as the piston uncovers the transfer ports, ending primary compression, the magic muffler delivers a strong negative pressure pulse that assists in moving the contents of the crankcase into the combustion zone above the piston.

Whatever the interactions, the outstanding performance of the Nelson Q-40 dispels any concern about primary compression short-circuiting.

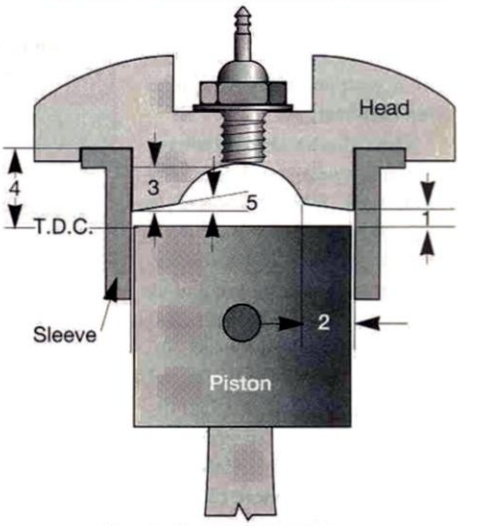
Current Quarter .40 rules limit the venturi bore to 9mm (0.3542 inch). The Nelson venturi looks much larger because its inlet horn diameter is huge—more than ¾ inch! Close inspection reveals a peripheral fuel induction hole at the rear of the venturi, allowing air to flow unimpeded through the section—no spray bar or jets here. The fuel induction hole communicates with the needle-valve assembly mounted directly behind; doubling as a retainer/fastener, the needle-valve assembly also locks the venturi to the crankcase.

Having a large bore and relatively short stroke, the engine is designated "oversquare," with a stroke/bore ratio of 0.83 to 1. It also has a relatively long connecting rod (1.3375 inch; 33.96mm the ratio of rod length to stroke is 1.9 to 1. This favorably high ratio reduces the degree of rod angularity at mid-stroke, minimizing side-thrust-induced cylinder-

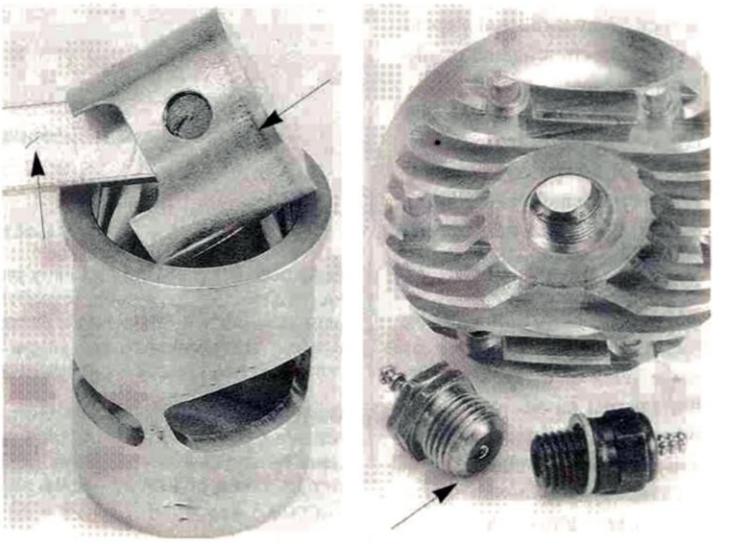




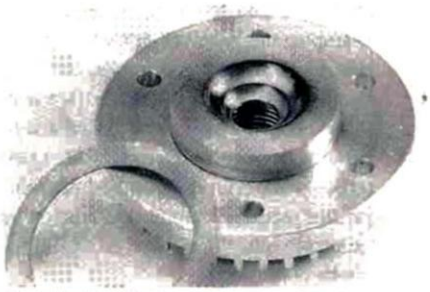
Nelson Quarter .40
Head and combustion chamber dimensions



1—Head clearance: 0.0185
2—Squish-band width: 0.174
3—Plug depth: 0.137
4—Deck height: 0.1925
5—Squish-band angle: 0°
% Squish-band area: 54%
% Combustion-chamber area: 46%



Left: notice the shiny band around the top of the piston near the crown; this is the running interference fit with the cylinder sleeve near TDC (arrowed). Black specs represent the typical appearance of high-silicon-content aluminum alloy. Note the music-wire retainer clip for the wristpin. The "X" on the connecting rod (arrowed) identifies its direction in relation to the marked piston—important when reassembling. Right: Nelson uses this special glow plug that doesn't rely on a gasket for sealing. Notice the chamfer on the threaded end of the plug (arrowed); this is compressed against a similar angle at the bottom of the threads in the head. A standard K&B 1-L plug is shown for comparison (above right).



"Double-bubble" combustion chamber, with state-of-the-art squish-band head and brass shim.

sleeve distortion and friction.

Combustion chamber volume above the piston at TDC (clearance volume) was measured by filling its space with Marvel Mystery Oil. This information in hand (0.44cc), the full-stroke geometric compression ratio is calculated to be 15.75 to 1—very high. However, effective compression ratio (ECR) is considered by most experts as a more realistic measure of an engine's ability to compress. With a 200-degree exhaust period, the Nelson Q-40 closes that port very late, resulting in a more realistic ECR of 8.26 to 1.

Nelson nonchalantly suggested that the Q-40 was, "... just a Quickie 500 engine with an FAI sleeve." The Quickie portion comes from the engine's general layout of front intake and side exhaust. The FAI sleeve refers to the porting, designed to operate beyond 30,000rpm (the preferred method for achieving high horsepower in 2-stroke-cycle engines). You'll recall from previous columns that horsepower is a calculated commodity: the product of crankshaft torque and rpm. Increasing horsepower allows a vehicle to accelerate faster and attain a higher final speed—important characteristics for any racing machine.

At these shaft speeds, the engine must be allowed to breathe freely. To ensure this, the crankshaft and sleeve ports must be made *larger* and remain open *longer* than ports in low-speed designs. At design speed, these ports remain open for very short periods; for example, at 30,000rpm, an acceptable exhaust period of 200 degrees would allow the port to remain open for only 0.0011 second; this includes the initial opening and final closing segments, which are naturally restrictive (like the first and last portion of an opening and closing door, when no one can get through).

PERFORMANCE TESTING

To the uninformed, R/C pylon racing simply involves flying left-hand turns for 10 laps. From the maximum performance point of view, there's much more to the process. Besides the obvious requirement of flying close to the pylons, the *type* of turns makes a significant difference in lap times.

There are many racecourse flying styles; the spectrum ranges from smooth, semicircular laps to those incorporating corners at each pylon. Examining these techniques and their effect on engine-propeller function will dramatize the importance of adapting torque/horsepower performance graphs to optimize a particular flying style.

The Nelson Quarter .40 exhibits a "peaky" horsepower curve. Operate it 1,500rpm beyond its peak, and you'll lose more than 8 percent of its horsepower (almost ¼b.hp); therefore, it's important to stay near the 29,000rpm peak with the propeller of your choice. A smooth flying style has low lap-time rewards; however, one high-drag turn can easily add several tenths of a second to an otherwise good lap. Nelson suggests starting with a 7x7½ wide-blade propeller; ground rpm for this prop is about 25,000.

DYNAMOMETER RESULTS AND CALCULATIONS

Contrary to what you might think, this engine was a pussycat to operate. It hand-started easily for each test, used the same glow plug throughout and responded to needle-valve adjustments positively—exhibiting a broad range between rich and lean throughout its shaft-speed envelope. All needle adjustments were made from a remotely mounted BVM* aluminum mixture-control unit. For each dynamometer load beam (pitchless propeller), the needle valve was set slightly rich but very close to the engine's peak-power air/fuel ratio; it was checked and readjusted using a TNC Electronics* digital optical tachometer and the fuel-line pinch technique described in previous columns. Forced-air cylinder/cylinder-head cooling was provided by a rheostat-controlled, dual-duct squirrel-cage fan. The cylinder head temperature was allowed to stabilize at 375 degrees F, where torque and rpm data were recorded. This process was repeated with seven other load beams. From my notes: "... the engine seemed happiest while operating above 24,000rpm." This corresponds with Nelson's contention that the engine "comes on the pipe" about that speed; the torque curve shows a relatively smooth, linear increase beyond that point. If my neighborhood allowed an open-exhaust (no muffler) dyno test, it would pinpoint the effect of the tuned pipe (by comparison of curves). Incidentally, the high-pitched whine of a 30,000rpm exhaust note is prodigious—even with hearing protectors!

The Nelson Quarter .40 produced an astounding 7.7b.hp per cubic-inch displacement; easily one of the most powerful naturally aspirated piston engines ever produced, in any venue. It also cranked 104 oz.-in. of torque at 26,500rpm—very high for such an elevated speed. Its 3.05b.hp @ 29,000rpm is enough to propel a meticulously prepared racing model beyond 200mph. Assemble three or four of these for a closed-circuit race, and let the excitement begin!

**Addresses are listed alphabetically in the Index of Manufacturers on page 150.* ✦

Dynamometer Data

Rpm	Torque (oz.-in.)	Corrected b.hp	B.hp	Correction factor
15,400	58	0.93	0.89	1.04
18,000	70	1.3	1.25	1.04
20,900	82	1.77	1.7	1.04
24,300	98	2.45	2.36	1.04
26,500	104	2.84	2.73	1.04
28,200	102	2.96	2.85	1.04
29,000	102	3.05	2.93	1.04
30,200	91	2.84	2.73	1.04

Wet bulb (F)—65 Dry bulb (F)—70

Bar. pres. (Hg)—29.47 Vap. pres. (Hg)—0.55

Effective PROGRAMMING

by DON EDBERG

MORE ON MIXERS

IN THE OCTOBER '98 issue, we started our discussion of programmable mixers. These are special functions that allow you to define how one control movement automatically produces a change in a second function that is usually unrelated to the first. I presented the example of Aileron —> Rudder mixing, which produces rudder motion whenever the aileron stick is moved (useful for making smoother, coordinated turns). This time, we'll learn more about mixers and some other things that these versatile functions, may be used for.

The Aileron —> Rudder example presented last time is a good one to look at for a problem that occurs when you mix common built-in functions, such as flaperon or V-tail, with programmable mixers; in fact, it brings out what I like to describe as a "flaw" of the systems, where the mixing of a mixer and a built-in function can cause difficulties.

Let's again consider Aileron —> Rudder mixing. Suppose you wanted to use this type of mixing on a V-tail

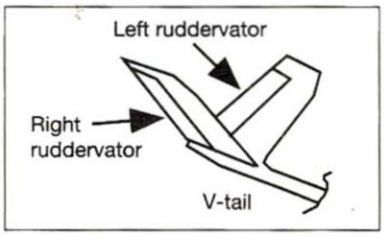


Figure 1. The V-tail with its "ruddervators" (combined rudders and elevators). They move together for elevator control and in opposite ways for rudder control.

model such as a Beechcraft Bonanza or a Super-V sailplane. What happens? If you turn on the mixer in the usual way, you'll tell the radio to mix from the aileron stick input to the rudder output of the receiver. Now remember that with a V-tail, you need two servos—not just one as you do for rudder (see Figure 1). The servos are plugged into the rudder and elevator outputs of the receiver. Now, when you move the aileron stick, what happens? Well, it may be that only the servo plugged into the rudder output channel will move in response! (This may occur on some radio makes and models and not on others.) This, if commanded in flight, would cause the plane to pitch and yaw and fly strangely and possibly cause you to lose control of it. The reason for this may be understood better by examining Figure 2, where the programmable mixer is shown as a

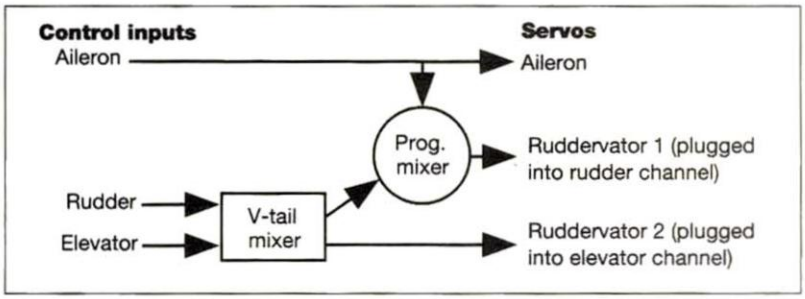


Figure 2. With some radios, when you couple ailerons to rudder with a V-tail, mixing occurs only on one side of the V-tail. The other side (ruddervator 2) does not respond to aileron. This is incorrect and is not what the mixer should do for a V-tail; both surfaces should respond.

circle, while the system's V-tail mixer is shown as a square. Notice that the aileron control inputs downstream of the V-tail mixer, so it only (wrongly) affects one of the two V-tail's surfaces.

How does one take care of this? It depends. On more primitive radios, you can always use "brute force" to fix this problem by programming a second mixer to provide Aileron —> Second Tail Surface mixing. However, a better way is to use a special function that tells the mixer to operate upstream of the preprogrammed function, if the radio has it. Futaba* calls this "Link," and it properly mixes the functions before the signal is transmitted to the V-tail mixer, so both sides of the V-tail will respond. This is shown in Figure 3.

The link feature and its ramifications can be confusing, and often, the radio manufacturers don't help; in fact, one of the most misleading aspects of systems sold is the labeling of receiver output channels. The V-tail provides a good example: the receiver outputs may be labeled as elevator and rudder, but for a V-tail model, each output in fact performs both functions. You'll find a similar situation with flaperons, where two servos work both as flaps and ailerons, yet the receiver outputs are labeled as "aileron" and "flap" or "AUX." This can be confusing!

For a long time, I have advocated a different scheme—one in which the primary functions that are initiated by stick or knob movement go by letters and the receiver outputs go by numbers. With this system, the primary controls would be much more understandable, e.g., roll control for banking the wings (formerly aileron) would be "R," pitch control (making the fuselage point up or down by elevator) would be "P," yaw control (rudder) would be "Y," speed control (throttle for power, flaps/spoilers/butterfly/crow for gliders) would be "S," etc. Of course, in the best of all worlds, you'd be able to define the receiver output channels, too, and that would help when using a 5-channel receiver with an 8-channel radio. For example, you could define the two flaperon outputs to be Ch. 1 and Ch. 5 (often, they're higher than channel 5, so they aren't accessible on 5-channel receivers).

If the manufacturers were to implement this arrangement, there would be

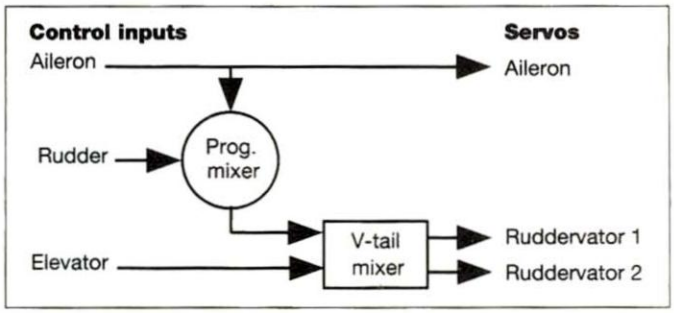


Figure 3. With link on, mixing is input before the V-tail mixer and properly goes to both sides.

less confusion on how mixers are programmed. If you wanted Roll —> Yaw mixing (Aileron —> Rudder coupling) on a conventional model, you'd program the mixer with master channel = R = Roll —> (mixing into slave channel) Ch. 4 (if Ch. 4 was defined as yaw output). If you had a V-tail, you'd program R —> Y (roll master, into slaved yaw input). This is what the link function actually does. But it might be nice if the radio manufacturers gave us more control over it.

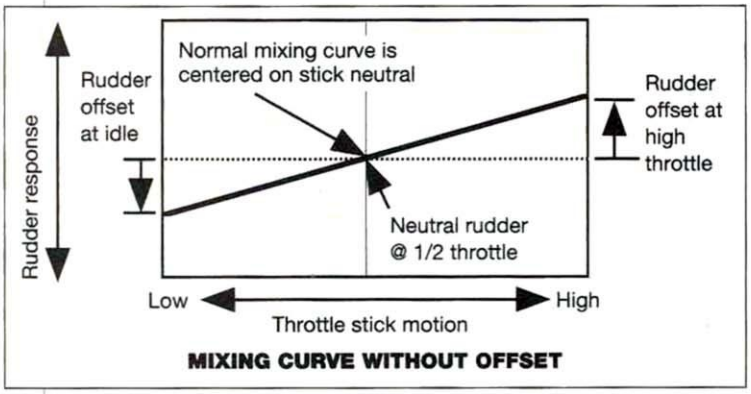


Figure 4. With a non-centering function such as throttle, the mixing curve is still centered at stick neutral. This produces rudder response at both ends—not wanted.

MIXING FOR NON-CENTERING FUNCTIONS

So far, I've talked about mixing functions as applied to centering functions such as ailerons, elevator and rudder. What happens if we want to use them with non-centering functions such as throttle or flaps? In principle, nothing. For instance, you might want to apply a little rudder when you give high-throttle amounts to account for torque effects. You'd define the master channel as throttle and slave as rudder. Now, however, you have to understand how the mixer works. The most common types of mixers work from the stick's neutral position, meaning that there's no rudder at ½ throttle (center position), some rudder at full throttle and the opposite amount at idle. This is illustrated in Figure 4 and isn't really what we want.

We really want the mixer to apply no offset at idle, half offset at ½ throttle and full offset at high throttle (see Figure 5). To do this, we offset the mixing line. In this case, we've raised the line so that the zero-rudder-movement point coincides with low throttle. With this arrangement, we will get maximum rudder motion at full throttle and zero at low throttle.

On most systems, the default position is as I mentioned earlier: at the stick's neutral position. The usual procedure to offset the mixing curve is to enter the programmable mixer's data input screen and move to the offset menu. Then we move the master channel control, i.e., throttle stick, in our example, to the place where we want no mixing to occur (idle or low throttle). Next, this desired position is entered in memory by pressing a specified combination of keys. Usually, a numerical value on the screen is changed (from 50 to 0 percent, for example), and the mixing curve is now offset from the master's neutral channel.

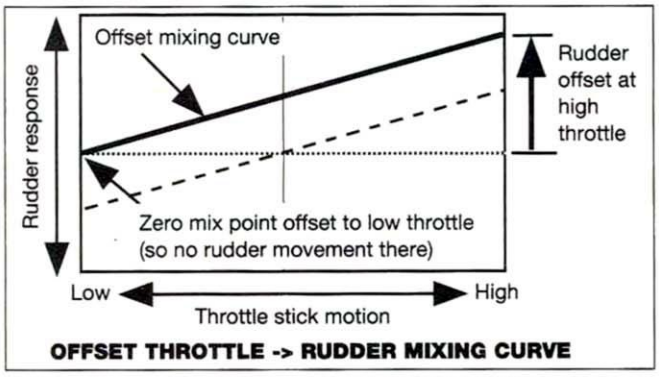


Figure 5. If you can offset the "mixing point" (the point at which the master does not affect the slave), you can make the trim change only at the top end as desired. Note that there is no rudder offset at idle, as desired.

TURNING MIXERS ON AND OFF

How you can turn your programmable mixers on and off depends highly on which brand and make of R/C system you use. On the simpler systems, you can usually choose whether the mixer is on all the time or whether you manually turn it on and off. You'd probably only want something like Throttle —> Rudder mixing during takeoffs and would shut it off the rest of the time. You might want Aileron —> Rudder mixing on all the time ... or not, depending on your flying skill.

On the cheapest (oops!—most economical) systems, you often don't have a choice of which switch turns the mixing function on, or which direction you turn the switch. On more expensive systems, you have more choices. You can usually choose the on/off switch and the directions in which you turn it on and off. This may be combined with other built-in or programmable mixer functions to get a set of things to happen when you flip the switch. For example, you might want to combine the offset rudder mixing with the landing-gear switch, so it's only on when the gear are down. The Futaba 8U has another option: you can have the system turn your programmable mixer on whenever the throttle is moved past a predefined position. This feature is very handy for power- or speed-dependent mixing functions.

FUTABA INTRODUCES NEW RADIO

Futaba has discontinued its popular System 8 series of R/C products (designated 8UAF/8UAP/8UHF/8UHP), but don't worry; a new model—the Super 8—will replace it. The transmitter is physically the same as the non-Super systems and has different labeling to indicate the new model. Electronically, the Super 8 has two more programmable mixers (both of the five-point-curve type) and a channel-select feature to make it easier to fly with 5-channel receivers in the airplane mode. The helicopter menus now have Gyro and Governor functions to make it easier to set these things up. The radio still has eight model memories and is quite similar in operation to its predecessor.

Remember, if you want to write to me, send an SASE to Don Edberg, 4922-N Rochelle Ave., Irvine, CA 92604, or email me at dynamic3@flash.net, or look for an answer at www.flash.net/~dynamic3. I get lots of mail, so please be patient!

***Note to manufacturers of electronic gadgets for R/C systems**: I am compiling a list of such items for a future column. Whether it reverses servos, warns of low batteries, automatically mixes, or does anything else related to R/C, please send the pertinent information to me at 4922-N Rochelle Ave., Irvine, CA 92604.*

**Addresses are listed alphabetically in the Index of Manufacturers on page 150.* +

SR Giant Scale!

If you're into Giant Scale aircraft, we've just introduced some new battery packs specifically for you!

Our new ***1600 Series*** pack replaces our 1500 Series pack that so many of you have chosen as the standard for Giant Scale aircraft. In addition, we've also updated our 1800 Series pack replacing it with our new ***2000 Series*** pack.

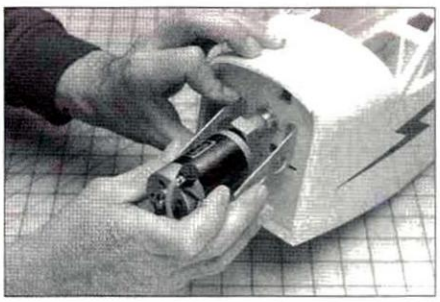
The exciting thing about these two packs is that they will give you much more flying time than a 1200mah pack yet they are no larger or heavier! *Both* the ***1600 Series*** and ***2000 Series*** packs weigh 7.4oz and in a flat pack measures only 3.5" x 1.7" x .9" .

If what you really want is a 1200mah pack, no problem! We're also introducing our new ***1200 Series*** pack that only weighs 5.4oz and in a flat pack measures only 3.5" x 1.4" x .9"! As you can see, it's much smaller and lighter yet it still gives you all the power you'll need for large aircraft with lots of servos.

In addition to our new packs, we've also added ***Volume R-7*** to the ***R/C Techniques*** library. Volume R-7 will tell you everything you ever wanted to know about the wiring of large scale aircraft. If you're not familiar with *R/C Techniques*, it's a bi-monthly publication we publish covering all phases of our R/C Hobby. We maintain a complete library of back issues so that you can catch up on anything you've missed. Here are the specific questions answered in *Volume R-7*:

- Why would you need a higher capacity battery pack?
- Why wouldn't you need a higher capacity battery pack?
- What size range is generally the best to use?
- Other than capacity, why else wouldn't you want to use a standard size battery pack on a Giant Scale aircraft?
- What does the internal impedance of the pack have to do with your pack choice?
- How low a voltage is too low?
- What charge rate should you use?
- Can you extend the charge time to make up for a charger that doesn't charge at a high enough rate?
- Why shouldn't you use a "peak detection" charger?
- Should you use a 4 or 5 cell pack?
- Why would you want to use a 5 cell pack?
- Why wouldn't you want to use a 5 cell pack?
- Why don't 5 cell packs give you more flying time?
- What wire size should you use?
- How should you extend the leads on a battery pack?
- What size wire should be used for servos?
- Which is more important, the battery pack lead or the servo leads? Why?
- Should you ever use an aileron extension to extend a battery pack lead?
- Is there a better type of system switch?
- Why should you only use "slide" switches?
- How can you use double switches?
- What cycler and ESV loads should be used on larger packs?
- Which battery backup systems are best?
- Do you really need one?
- How can I power the receiver from one pack and the servos from a second battery pack?
- What receiver modifications are necessary?
- What size pack should be used to power the receiver?
- What size pack should be used to power the servos?
- How shouldn't you power accessory items such as smoke pumps and ignition systems?

The best part is that ***Volume R-7*** of *R/C Techniques* is only $3 including postage! We'll even include a complete index to both the *R/C Techniques* library and the *Electric Flight Techniques* library at no extra cost!



By the way, ***Volume E-14*** of *Electric Flight Techniques* gives you complete instructions and plans for converting the Hangar 9 Giant Scale Cub from gas to electric power!

Call us if you have any questions or to place an order. You can reach us at SR Batteries, Inc., Box 287, Bellport, New York 11713. Our phone is 516-286-0079 and our fax is 516-286-0901. Our Email address is 74167.751@compuserve.com .

Regarding ROTORS

by RICK BELL

A NEW COLUMN FOR EVERYTHING HELICOPTER

My newest heli student: Larry Marshall. Larry is flying a Shuttle Z-TS from Hirobo. Powered by an Enya .35, the Shuttle was one of the very first .30-size helis to hit the marketplace and has been around for a very long time. Replacement and upgrade parts are readily available.

MY NAME IS Rick Bell, and I'm pleased to be writing a new helicopter column for *Model Airplane News*. First, a little about myself: I started flying helis in 1989 with a Kyosho Concept 30DX using a 4-channel airplane radio. I learned to hover with this setup before I got a proper heli radio. Later that same year, I entered my first contest and became completely hooked. From there I started flying Schluter helicopters, and I continued competing in contests with good success. I have also dabbled in scale but now I mostly sport fly and do some demo flying. Having fun is the number one goal.

For the past few months, I have been teaching editor-in-chief Larry Marshall how to build and hover helicopters. There is a false presumption out there that learning to fly helicopters is difficult and costly. This is just not so. With today's reliable equipment and all of the knowledge available from other heli pilots, there is no reason that anyone cannot learn to master these rewarding and challenging machines—just ask Larry! What I would like to do with "Regarding Rotors" is to pass along some of this knowledge so that you, too, can be successful. From building your first heli to doing 3D aerobatics, I hope to touch all the bases. If there is something you'd like me to cover, please contact me through *Model Airplane News* at 100 East Ridge, Ridgefield, CT 06877-4606.

The Nexus .30 from Kyosho is typical of the excellent choices in the .30-size heli category. Thirty-size helis are a good choice when first starting out.

WHERE TO START

I'm often asked, "What is a good trainer helicopter?" There is no easy answer to this question. There really is no pure "training helicopter" similar to a trainer airplane. Helicopters can be set up for different flight proficiency levels. For example, someone who is learning to hover does not need a large collective pitch range as is needed for 3D aerobatics. The beginner only needs enough collective pitch to hover. This makes the collective control a lot less sensitive and much easier to manage.

So what is a good heli to start with? Well, that depends on your pocketbook. There are three classes of helicopters (determined by engine size) on the market today: the .30- to .35, .40- to .50 and .60-size classes. Each class has its advantages and disadvantages. Gasoline- and 4-stroke-powered helis are also available, but these are not recommended for beginners because of their higher cost.

There are many choices in the .30-size class. This is the most popular size for beginners, and almost every heli manufacturer has a .30-size entry-level kit. If building a heli seems too intimidating for you, then there are almost-ready-to-fly (ARF) models available that come with all of the major components factory-assembled. Many beginners start here because the chance of having something assembled incorrectly is eliminated. The ARF builder has only to install the radio and gyro and connect the major components to the chassis. Some of the advantages of .30s are low entry cost, small size, fuel economy and lower parts' cost. One disadvantage is they tend to be blown around more by the wind because of their smaller size and weight. Also, because of the lower cost of .30-size helis, you can take the money saved and invest it in a flight simulator. Indeed, .30-size helis are a great way to get started.

The mid-size helis (.40 to .50) share some of the attributes of their smaller .30-size cousins, but they are more costly to buy and run because their larger engines use more fuel. Their larger size does, however, make them a little easier to handle in the wind.

The .60-size heli is considered the king of the hill. It is very stable, very aerobatic and very much like a good pattern plane, as far as flight characteristics are concerned. I feel .60-size helicopters are also more durable because their parts are stronger, and this makes them more cost-effective in the long run. In the past year, the cost of some .60-size helis has come way down. For example, Miniature Aircraft USA* and Horizon Hobby Distributors* both have .60 helis that cost less than $500, though parts and operation costs are obviously higher.

Above: a high-end machine, the Miniature Aircraft USA X-Cell .60 is a very stable, high-performance heli. Note that many of the parts in this heli (frames, boom, supports, blade, etc.) are made of composite graphite. Left: this .60-size Futura S.E. from Robbe/Schluter is an excellent performer. The stock Futura is a very well-engineered machine and can do it all.

When selecting a first helicopter, visit your local flying field or hobby shop and see what the other heli guys are flying. Ask what equipment they use. By using the same equipment as the local pilots, you will have an existing knowledge base to help you. With helis, knowledge is a great advantage for the beginner.

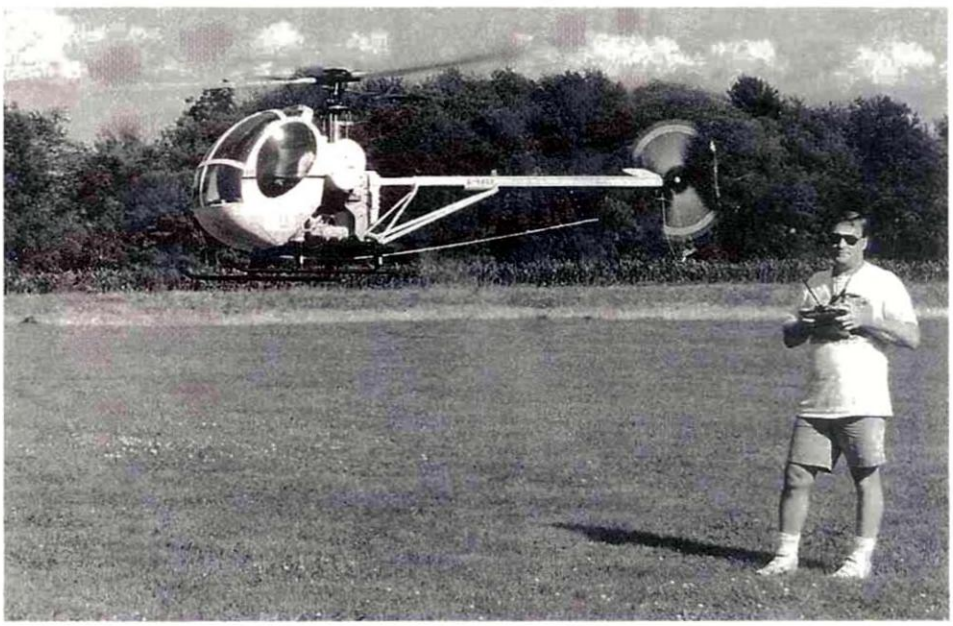
GYROS

Without a doubt, the gyro was one of the best inventions to come along for model helicopters. It tamed the most difficult to control part of the helicopter—the tail rotor. There are many options and price ranges for gyros, but you do not need to learn on the most expensive one. Unless you are into competition, precision aerobatics, or wild 3D maneuvers, a low-cost gyro will work just fine. Gyros cost from $100 to over $250, and I think beginners should spend their money on fuel instead of on the fanciest, newest gyro when learning to fly.

There are two basic types of gyros—mechanical and piezo—and gyros come with single or dual rates. Dual rates allow for greater gyro authority during hover and the ability to switch to a lower authority for aerobatics. Mechanical gyros use a motor and a spinning flywheel for feedback, while piezo gyros use prisms and electrical current for feedback and have no moving parts to wear out. Mechanical gyros are the standard that heli pilots have used for years. This is changing, however, because the piezo gyro is coming down in cost. You can now buy a single-rate piezo for less than the cost of a dual-rate mechanical gyro. Who says competition is bad?

HELI RADIOS

There are three price categories for radios: entry level, mid range and top of the line. If your budget allows, you should start with a mid-priced radio. Entry-level radios have some



My latest scale project is this Schweizer 300. Built on a modified Futura frame, the 300 is powered by a .90 engine. Impressive model.

features that make them attractive for the newcomer, but if you progress quickly into forward flight and aerobatics, you will quickly outgrow your entry-level radio. Entry-level radios provide only basic functions. Top-of-the-line radios, on the other hand, have many features that a beginner will never use. Plus, they can be difficult to program, not to mention very expensive. The mid-range radio makes the most sense, as the new heli pilot will probably never outgrow it. Mid-range radios have plenty of program features and are fairly easy to use. They can easily take you from learning how to hover all the way to 3D aerobatics, if you so choose.

I have mentioned flight simulators; they are a great investment for learning to fly helicopters. Flight sims are great tools, and some of the newer ones allow you to use your own transmitter. A side benefit of this is that you can learn to program your radio and see how minor changes affect flight performance without risk to the helicopter.

The JR 8103 is an excellent mid-range radio that's well suited to the beginner heli pilot. You won't outgrow its features.

But the best advice I can give you is to get an experienced heli pilot to help you! He can set up your heli, test-fly it and trim it for a stable hover. This will put several weeks of work behind you and will instill in you a higher level of confidence. You will know from the beginning that the heli is operating properly and that any difficulty you're having is because of your flight proficiency.

Helicopters are a great aspect of our hobby; they offer greater challenges and greater rewards. Whether your interest is in scale or 3D aerobatics, today's helicopters can do it all with ease and reliability. They do, however, require regular practice to achieve success, but this applies to any worthwhile endeavor.

You can contact me at 219 County Rd., Torrington, CT 06790, or via email at rbelloz@snet.net. See you next time.

**Addresses are listed alphabetically in the Index of Manufacturers on page 150.*

by GEORGE LEU

WARBIRDS FROM DELAWARE

One of the things I like about writing this column is the field work. I enjoy interviewing scale modelers to find out their opinions about things such as products, and I like talking with manufacturers as well to understand more about their product lines. I have had the opportunity to attend a good number of flying events this year and to fly several airplanes (my own and those of many other trusting people). It has been a wonderful season for me, with many learning experiences.

One thing I have learned is that particular aircraft designs don't necessarily mean the same thing to different modelers. Some modelers will look at an airplane as a good flier, while others will see the same airplane for its historical significance. I've also noticed a trend in which some modelers concentrate on a particular aviation era or even on one specific design.

This column is dedicated to those who have found a particular area of scale modeling that suits them; I truly admire their dedication and the success they have achieved. I hope others can be motivated to develop their own special niches as well.

THE NEW PROCTOR ENTERPRISES

There are many types of scale models that turn me on and make me want to get back to the workshop. If I had to select an era of aviation to study and from which to develop flying scale models, I think that the period of time from WW I to just before WW II would be ideal. The aircraft from this era remain some of the prettiest—yet simplest—forms ever to become airborne. Many aviation milestones happened in this period, including Lindbergh's crossing of the Atlantic, Amelia Earhart's development as America's gallant woman aviator, the Cleveland Air Races, air mail postal service, etc.

Warplanes of this period retained simple design and flight characteristics; the idea of "heavy iron" flying machines did not yet exist. Many designs were created by companies that went out of business during the Great Depression, leaving only historical footnotes for us to investigate.

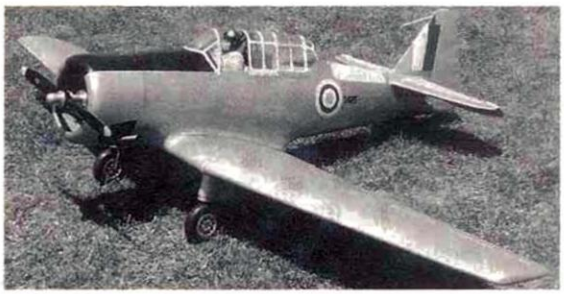
Proctor Enterprises has always been dedicated to this era, and the company is now under new management. After 13 years of operation, Mark and Dick Heininge sold the company to Joe Topper and Gary Parker, both of whom have been involved with Proctor for years, and both of whom are avid scale modelers.

There are some new things happening at the company, including the re-release of the Albatros DVa and Curtiss Jenny kits. Future releases may include the Travelair 2000 and 4000 biplanes in ¼ scale, and the development of other "golden age" aircraft is likely. The VK and Duncan Hutson kits will continue to be offered as part of the Proctor line. I wish Joe and Gary the best in their endeavors.

Sid Miller built this beautiful Curtiss Jenny from the Proctor kit. Power comes from an O.S. .90.

WARBIRDS OVER DELAWARE

I attended the 1998 Warbirds Over Delaware meet, and it was well worth the trip. This year, the quality of the models was the highest I have seen in my four years of attendance. I was also impressed with the pilots' flying skills.



Top: Dave Jaggie modified a damaged Ziroli Texan into this great-looking BT-14. At 23 pounds and powered by a G-62, the model flies with authority. Above: how's this for a kit-bashed Aeroplane Works/Ziroli Texan? Dan Basovitch turned his Texan kit into an unusual Wirraway.

This event remains dominated by Nick Ziroli* aircraft, but there were also quite a few Meister Scale* and Vailly Aviation* warbirds beating up the runway. A good example of a generic, all-purpose warbird is the AT-6 Texan from companies such as Ziroli, Midwest* and Yellow Aircraft*. I counted over 30 examples of the AT-6 in the pit area. The majority were painted yellow or some other colorful trainer paint schemes. Most included retracts, Zenoah G-62s for power, detailed cockpit interiors, etc. None exhibited any bad tendencies other than wanting to stay airborne, even when they tried to land.

I found two individuals who liked

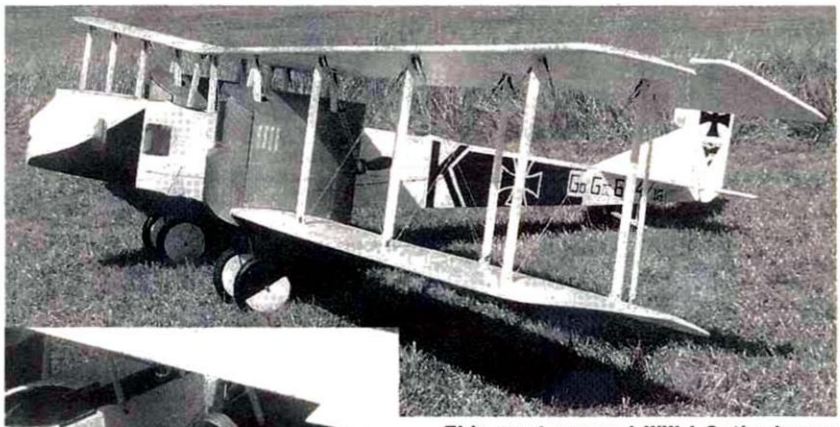
the flight characteristics of Texans but who wanted to try something different—Dan Basovitch with a Wirraway and Dave Jaggie with a BT-14. Dan kit-bashed an Aeroplane Works* Ziroli Texan kit to produce his Wirraway. It differs from the AT-6 in that it has rounded wingtips, a rounded rudder and a fabric-covered fuselage, and it includes wing, fuselage and rear cockpit armament.

Dan's aircraft is a real attention-getter, and he let me fly his T-6 and his Wirraway. I found the Wirraway the more gentle flier. Dan's model spans 111 inches, weighs 28 pounds and is powered by a Zenoah G-62.

The BT-14 was an early version of the AT-6 and looks almost identical to the Texan, except it has a shorter engine cowl and fixed landing gear instead of retracts. Dave's model also started life as a Ziroli AT-6. After a crash wiped out the model's wing center section, Dave was ready to throw out his aircraft. Luckily, he found some photos of a BT-14 and with a few minor modifications, rebuilt the damaged Texan into his new BT-14. Dave used the cowl from a Ziroli Corsair (with the cowl flaps removed) and found it ideal for use with the BT-14. His finished aircraft weighs only 23 pounds, and the Zenoah G-62 hauls it around the sky with great authority.

Top: Ty Brown showed up at the Delaware Warbirds meet with his new, 84-inch-span Me 109. Powered by a Q42 and weighing 18 pounds, Ty's model will be offered as a short kit from Meister Scale. Above: Ty's other German aircraft is this unusual TA 152H; a modified FW-190D. Ty used a modified Meister Scale plan and some parts to complete his high-altitude fighter.

Gotha GIV twin-engine bomber to the Delaware Warbirds meet, and I was very impressed with his model. This scratch-built, 40-pound giant is built of lite-ply, not balsa, and has taken almost three years to complete. Sal is debating whether to use a pair of Zenoah G-23s or a pair of G-38 engines to power the Gotha. Since the plane balances correctly with the G-38s installed, the extra horsepower would be used only in emergencies. Sal likes to build models that have a unique place in aviation history, and the Gotha was one of the first heavier-than-air aircraft to bomb London during WW I; a very interesting and unusual model, indeed.



This most unusual WW I Gotha heavy bomber is the work of Sal Calvagna. The impressive model is powered by twin Zenoah G-38s.

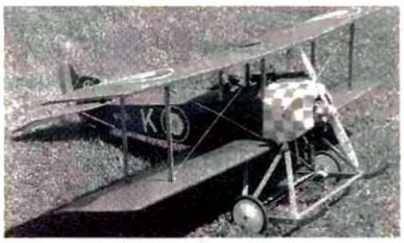
WHAT'S A GOTHA?

Sal Calvagna from Holbrook, Long Island, NY, brought a beautiful WW I

A ONE-MAN LUFTWAFFE

Ty Brown from Kanapolis, NC, showed up in Delaware with his long-winged TA-152H that he built from modified Meister Scale plans. Ty also showed off his newly completed original design Me 109. The TA-152H has a wingspan of 144 inches and is powered by a Quadra* Q 75. At 40 pounds, the model flies very nicely. Since it's the same scale as the Meister Scale Focke-Wulfe 190-D9, Ty used the spinner, retracts and plastic parts from Meister Scale to complete the model. His model definitely has a big "wow" factor.

Ty's new, 84-inch Me 109 weighs 18 pounds and flies very well on a Quadra Q42. Century Jet Models* retracts were used after removing 2 inches from the gear strut length. Meister Scale intends to offer a short kit of this plane with formers, foam wing-cores, spinner, canopy and plans.



***The super-looking Sopwith Baby is the newest design from John Tanzer. John flies the Baby with either wheels or floats attached; the plans for it will be in an upcoming issue of* Model Airplane News.**

JOHN'S NEW BABY

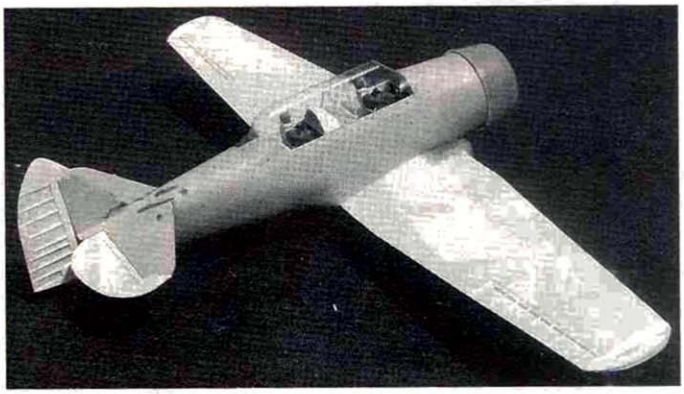
No stranger to warbirds, John Tanzer showed up at the event with his new, scratch-built Sopwith Baby. At 21 pounds and powered with a Roper 3.7 engine, this 77-inch, sport-scale design looks sharp and flies superbly. Look for a construction article on John's Sopwith Baby in an upcoming issue of *Model Airplane News*. I can't wait to get a set of plans for this one!

New from the Aeroplane Works, these nifty hinge-slot-cutting tools are packaged in pairs and work really well.

THE AEROPLANE WORKS

After a long absence, Chuck Gill and the Aeroplane Works are back in business cutting kits for Ziroli, Ron Weiss and the Jerry Bates plans. Chuck's newest kit is the Dewoitine D.520.C from Jerry Bates. His business plan is to keep five kits in stock for each design he offers. The Aeroplane Works is a full-time business for Chuck, and he is eager to hear from you.

Interestingly, it is not a new kit from the Aeroplane Works that has me excited; I am really jazzed by Chuck's new hinging tools. Packaged in pairs, these tools are made from fine-quality band-saw blades locked in a plastic-covered wooden handle. I have used these slot cutters and they work very fast, going through even the hardest wood. A pair of tools sells for $10 and includes both coarse- and fine-blade instruments. I guarantee that you will love these tools.



My latest project is a Midwest AT-6 Texan that I am building as a Harvard. Modifications to the tail and other cosmetic changes make the transformation easy.

MIDWEST HARVARD

My latest kit-bashing project is a Midwest AT-6 that I am modifying into a Harvard. Just as I mentioned earlier about Dan and Dave, I want a unique model. Basically, I've changed the rudder outline and have modified the exhaust outlet. Doing these modifications is easier than you think, and there are a number of aftermarket suppliers available with products to aid construction. I'll have more details on this project in an upcoming column.

Until next time, why not rethink the usual, dime-a-dozen modeling choices and try something different. There's such a variety of aircraft available for us to build—dare to be different.

**Addresses are listed alphabetically in the Index of Manufacturers on page 150.*

R/C CYBERNEWS

by JIM RYAN

RESEARCH ON THE WORLD WIDE WEB

THIS MONTH, I'd like to spend some time looking at ways the World Wide Web can help you in researching a scale project. As any experienced scale competitor knows, finding, assembling and organizing the documentation can be the most frustrating part of building a scale model. Even for relatively common aircraft, documenting a particular example can be tough, and for more obscure subjects, the task becomes very daunting indeed. This is where the World Wide Web comes in. Websites have revolutionized the publishing industry, in that anyone who has knowledge in a particular area can effectively become an author and share that knowledge with others who have similar interests. Bear in mind that some websites have only a fleeting existence, and using powerful search engines such as Yahoo and Lycos may turn up some sites that didn't even exist when I was typing this.

Surfing the Internet for information can be interesting, but I really spend less time on the Web than most computer users I know. I use it if I'm looking for specific information, but I seldom log on just to browse around. This is because searching the Web can be frustrating, due to the slowness of some sites. I think many webmasters get hung up on the "gee whiz" aspect of the graphics capabilities of the Internet, and they clutter their sites with animated icons and glitzy graphics that ultimately detract from the site's usefulness. As "Ian Malcolm" said in "Jurassic Park," "You were so busy asking yourself if you could, you didn't ask yourself if you should." For this reason, the sites that I bookmark for future visits are the ones that are content-intensive; I'm looking for information, not entertainment.

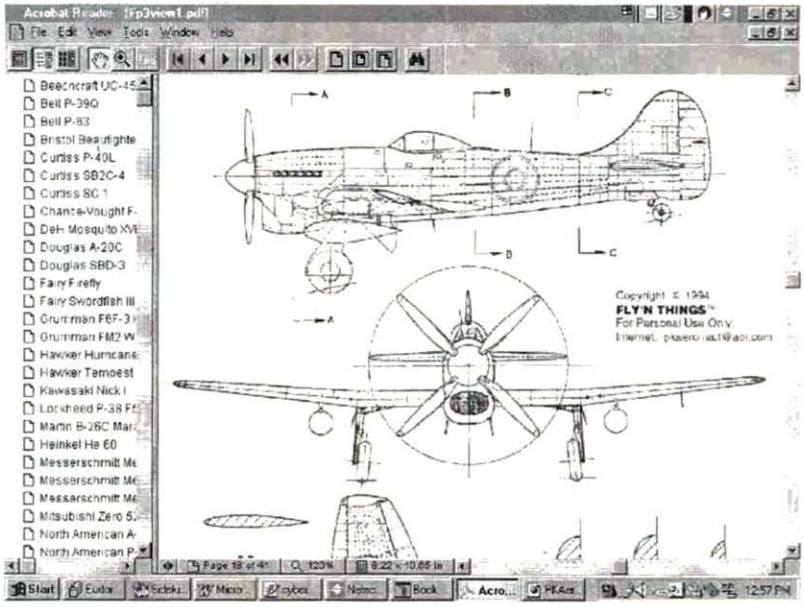


Figure 1. A number of documentation suppliers have websites that include downloadable catalogs of their 3-views. This is a page from PKAeronaut's (see text) catalog. Full-size hard copies of the 3-views you select can be ordered online.

SHOPPING FOR 3-VIEWS

After you've chosen an interesting project, the first step is to look for a suitable 3-view as a basis for the design. One of the best-known suppliers of quality 3-views and photo documentation is Bob Banka at Scale Model Research, http://imt.net/~ims/scale.htm. Bob has a nice website that allows you to order any of the over 33,000 3-views in his giant online library. Since there are often several 3-views available for a given subject, you can contact him by email to ask for specific information before you place your order. You can even download his latest catalog as an Adobe Acrobat Reader (.PDF) file so you'll have it handy at all times. Acrobat files are real time-savers; you can store the full text of a catalog on your hard drive, rather than having to log onto the Web each and every time you need to look for an entry.

Another good source for 3-views is the PKAeronaut aircraft site: http://users.aol.com/pkaeronaut/pkaacrft.htm. This excellent site also includes a downloadable Acrobat Reader copy of its catalog. Figure 1 shows an example of the 3-views contained in the catalog. The view can be zoomed and scrolled as needed.

There are certainly other 3-view suppliers available online, but this gives you a starting point. The great

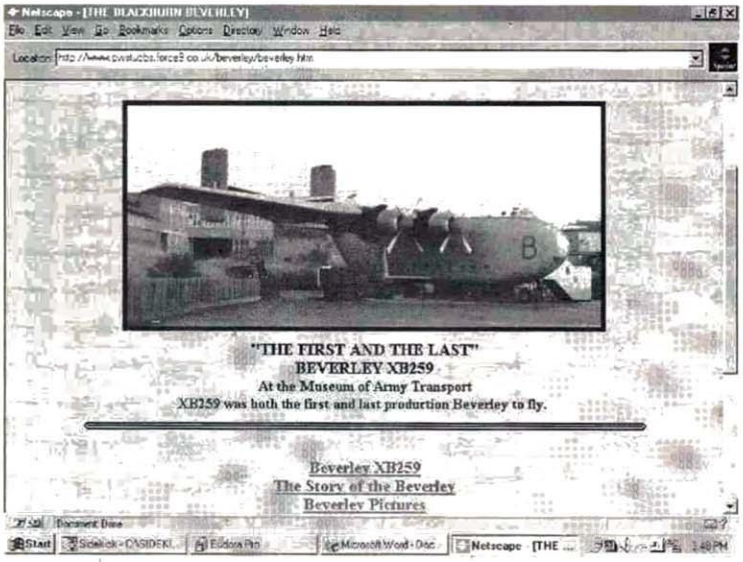


Figure 2. The World Wide Web really pays off when researching unusual projects. Here's a website devoted to the Blackburn Beverly, a fixed-gear military transport used by the RAF. The Virtual Aviation Museum (see table) includes links to museums all over the world that have examples of your chosen subject in their collections. There's almost no aircraft too rare to be documented online.

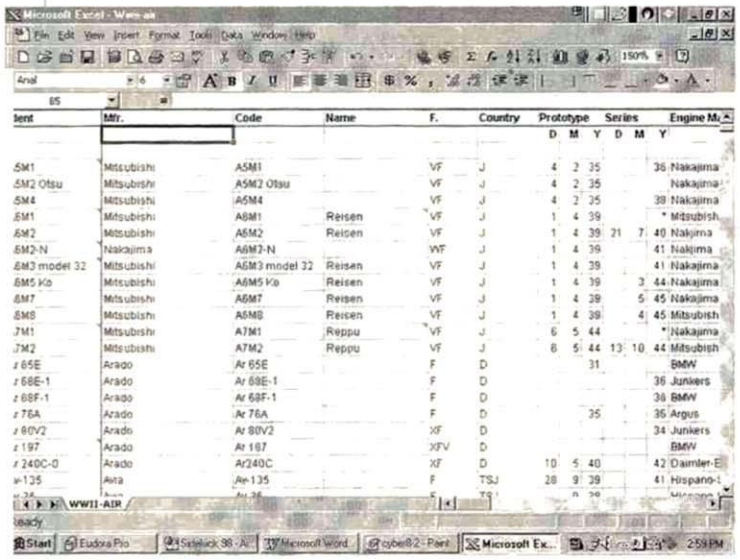


Figure 3. This database was downloaded from the Internet. It catalogs complete stats for every combat aircraft of the WW II era. Included are details like first flight date, engine type, dimensions, armament, etc. This database is a treasure-trove of documentation data, and it makes an excellent starting point for other spreadsheets that can calculate critical parameters for a model of any given scale.

thing about online searching is that you can even find documentation for very rare aircraft. Start a search and see what you find.

COLOR DOCUMENTATION

One vexing aspect of selecting a scale subject is choosing the color scheme. "Big Beautiful Doll" is one pretty Mustang, but I've seen enough renditions of that plane to last a lifetime. The dilemma is to find an interesting color scheme that's unique and yet can be documented for the scale judges. Well, friends, there are over a hundred P-51s flying today and scores more quietly resting in museums. And most—if not all—of those Mustangs are shown in living color on a website somewhere, so there's no excuse for not being able to find a unique color scheme, if you're so disposed. Some air museums today amaze me with the quality and organization of their websites. Figure 5 is a table of long-standing websites that have color photos of military and civilian aircraft. This doesn't come close to touching all the bases; there are hundreds of such sites. Start a keyword search for a particular aircraft, and you can quickly assemble a list of museums or private owners. From there, it's a matter of sending a few inquiries via email or a letter to request color documentation photos. Aircraft enthusiasts are terrific people, and I've gotten lots of help over the years, both from museum volunteers and private owners. By the way, the best thanks you can extend to people who help you with your documentation search is a photo of the finished aircraft. Make sure that you extend every courtesy so they'll be willing to help the next modeler who comes along.

SCALE MODEL REFERENCES: SETTLING ON A SIZE

Figure 3 shows a database spreadsheet that I downloaded from Milforum on CompuServe. The database contains the dimensions, weights, armament, powerplant and other specs for every combat aircraft of WW II. While nothing fancy, it packs an incredible amount of information in a compact, easy-to-understand format. To expand the usefulness of this great reference, I saved the database as an Excel spreadsheet and added a second, linked sheet (Figure 4) that extracts the critical dimensions (span and wing area) and calculates the dimensions of a model built to a variety of scales. By using this in conjunction with the weight calculation spreadsheet described in my April 1998 column, I can determine the weight, wing loading and stall speed for a model of any given size. This helps me to quickly arrive at the best compromise for size of a potential design. Needless to say, not all these exercises result in an actual model being built. My basement would be very full if it did! But it's fun and educational to play these "what-if" games.

READER MAIL

Judging from the nearly overwhelming response, the weight estimation spreadsheet that I discussed in the April issue struck a real chord with readers. I sent out around 400 copies via email attachment, and I have no idea how many were downloaded after Ken Myers graciously made it available from his EFO website, http://members.aol.com/kmyersefo/homepage.htm. There's no substitute for a lightweight airframe, and if you have a detailed weight budget before you cut wood, you're that much ahead of the game. I was also pleased to see that this simple tool inspired some readers to design some useful spreadsheets of their own. Among the experimental copies I saw were spreadsheets for analyzing airfoil performance, ducted fan efficiency and electric motor efficiency. This sort of creativity is great to see, and I'm glad my simple example made some of you look for more advanced applications for these useful tools.

The suggestions and comments I receive from readers are very much appreciated, and if there are particular topics you'd like to see discussed in

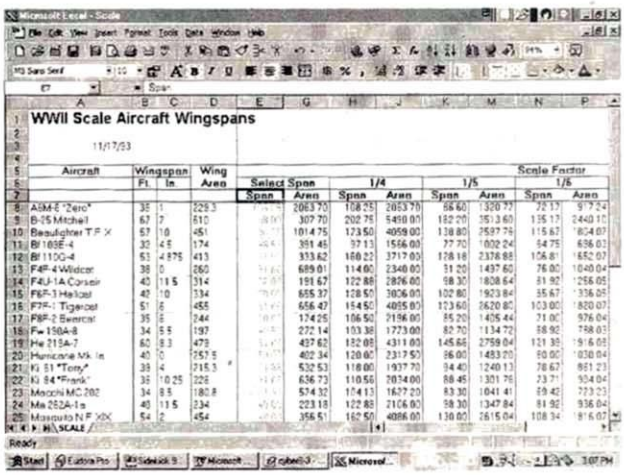


Figure 4. This simple spreadsheet contains the wingspan and area for a number of WW II aircraft. The other columns give the span and area for models built to scales of ¼ down to ⅛. Finally, there's an input column that will give the wing area for any span you choose. This is nothing fancy, but it's a useful little tool, especially in combination with the weight calculation spreadsheet detailed in the April issue.

- **Virtual Aviation Museum**
http://www18.pair.com/tvam/html/itd/itkp5.htm
Well-linked database with pictures and specs for a wide range of military and civilian aircraft.

- **Books International**
http://www.militarybooks.co.uk/books_international/
Huge selection of military and civil aviation books.

- **Monino Soviet Air Force Museum**
http://ritmpress.win.sinaps.ru/avia/company/monino/e_monino
Website dedicated to the world's most complete collection of Soviet and Russian military aircraft.

- **Fandal's Aviation Archive**
http://vorvan.sh.cvut.cz/asc/~fandal/archive.html
Archive and index page linked to a number of very good online image archives.

- **U.S. Air Force Museum**
http://www.wpafb.af.mil/museum/
Official website of the AFM. Very well organized, and the AFM has an on-site research library.

- **National Museum of Naval Aviation**
http://www.naval-air.org/
Official website for Pensacola's Naval Air Museum.

- **Lockheed Martin Aeronautical Systems**
http://www.lmasc.com/
One of the best of the websites maintained by modern aircraft manufacturers.

- **Totavia Aviation Image Collection**
http://www.totavia.com/gallery/index.htm
A very good online image archive. Also includes links to other sites.

Figure 5. CyberSampler: this table gives the URL for a number of websites that offer useful information on full-scale aircraft. There are hundreds of such sites, so this barely scratches the surface.

future columns, please speak up. Neither email nor columnists are foolproof, so if you fail to receive a response to your inquiry, don't be shy about asking again. As always, snail mail inquiries should include an SASE.

That's it for this month. With the end of the peak flying season fast approaching, I've put together a full schedule for the coming weeks. It seems there's never time to go to all the flying events I'd like to, but this summer has been unusually rewarding for me, and I hope it has been for you too. Now, with several designs queued up in AutoCAD, I'm ready for a very full building season. So many planes, so little time! +

by GREG GIMLICK

MUST-HAVES FOR ELECTRIC FLIGHT

IT'S HARD TO BELIEVE that Christmas is knocking at the door already. I hope you all have the best of holidays, and thanks for all the letters and photos you've sent. Keep sending your photos and descriptions so we can all share them; let's get 1999 off to a great electric flying start.

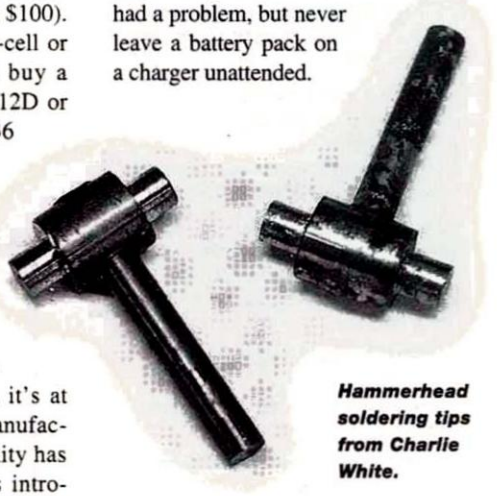
It's time we looked at some of the resources available to electrics fliers. The best thing I can pass on is something that Keith Shaw wrote years ago: "Buy cheap, buy twice." Buy quality equipment and do your research before spending those hard-earned dollars.

We'll begin by looking at some equipment I think you'll need, regardless of your future goals in electric flight, then go into some of the more "nice-to-have" things. You'll need a charger, something to power it with, connectors, soldering tools, motors and speed controls. You'll need battery packs, too, but I'll get to that later.

CHOOSING A CHARGER

The regret I hear from readers most often is, "I wish I had bought a bigger charger to begin with." Many folks buy inexpensive chargers that will handle only 7 or 8 cells and find out later that they need a new one because they're building airplanes that use 10 or more cells. Do yourself a favor and purchase something like the AstroFlight* 110D, which will handle up to 18 cells. I think it's one of the best buys for the money (about $100). If you think you may build 21-cell or bigger planes, go ahead and buy a larger charger like the Astro 112D or Aveox* Infinity; these handle 36 and 30 cells, respectively, and cost between $175 and $200. The nice thing about the Infinity is that you can program it to cycle your cells, too; Aveox has tried to keep the price competitive, but since Aveox is the U.S. distributor, it's at the mercy of the European manufacturer, and the price of the Infinity has climbed significantly since its introduction. I have both chargers and love them.

The next step up is the SR Batteries* Smart Charger which, it's my understanding, is undergoing some upgrading and production changes, so call SR for availability. This top-of-the-line charger will last a lifetime and monitors a lot of variables during the charge cycle to protect the pack. I prefer to avoid battery pack chargers that are only timed rather than peak-detecting. Don't worry about these chargers being only DC/DC chargers; I see it as a feature. In the field, I power my charger with a deep-discharge marine/RV-type battery, and in the shop, I power it with an Astro DC power supply. I've also used the battery in the shop, but some folks warn about that practice. I think it can be done safely and have never had a problem, but never leave a battery pack on a charger unattended.



Hammerhead soldering tips from Charlie White.

SOLDERING EQUIPMENT

Whether you make your own or buy commercially available battery packs, you'll need some soldering equipment. This is an area where you can do well for less than $25. I keep three irons in the shop (notice I said soldering "irons" and not guns); Weller 25-, 40- and 80W models fill all my needs and are available at hardware stores for less than $25 each. If you buy packs, you'll only need a 25W iron to solder the connectors and switches; heavier irons are necessary if you assemble your own.

In the photo, you'll see little hammerhead tips available from Charlie White at 4420 Ladera St., San Diego, CA 92107-4232; email: charliew@adnc.com. These are perfect to solder end-to-end packs and work remarkably well in the Weller 40W iron. I believe Charlie sells them for $6 each, including shipping.

Since we're talking about soldering items, we might as well touch on connectors. I can't over-emphasize the need for quality connectors. I recommend only Astro Zero Loss, Anderson* Powerpoles and Sermos* connectors. These are all excellent and will give

Dr. Walt Thyng and his Sig Astro Hog covered to match his Harley Hog. MaxCim 15-13Y geared 3:1; Master Airscrew electric 13x8 prop, 18 Sanyo 2000 cells; 7 lb.

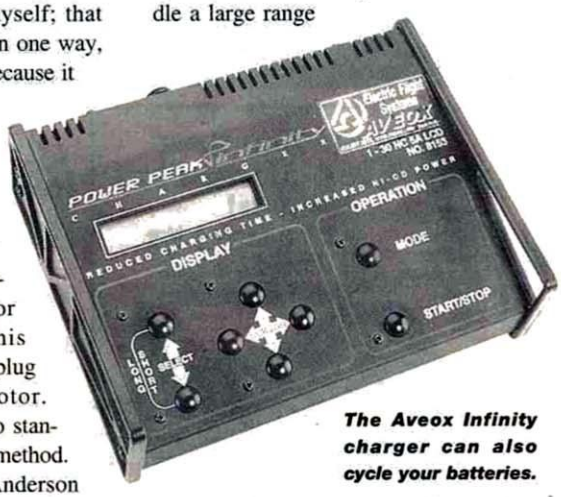
many years of service with little degradation. There are also some excellent European connectors that are hard to get over here, so please forgive my omission of them. Look for connectors that are made of high-quality materials, such as gold or silver plating, and that provide a positive lock. I also like to use connectors that protect me from myself; that means I can only plug them in one way, and I won't burn anything. Because it can get confusing working within the confines of a fuselage, I like to use the Anderson connectors on the battery pack and battery side of the speed controller and Astro Zero Loss connectors on the motor and motor side of the controller. This ensures I never accidentally plug a battery pack into a motor. Whatever type you use, try to standardize it, and stay with one method. The most versatile are the Anderson and Sermos connectors, but if you're not careful, you can plug them in reversed. I know it sounds hard to do since they are color-coded, but it happens all the time.

MOTORS AND CONTROLLERS

The last pieces of equipment we'll touch on briefly here are the motor and controller. Although almost all of the controllers out there are now high-rate, I still get mail from folks who have purchased a frame-rate version through one of the Internet discussion groups or at a swap meet. Be sure to get a high-rate controller unless you only need an on/off switch. Most controllers are also digital now, but there are some excellent analog controllers, too, so be sure to explain to the vendor how you expect to use it so he or she can sell you the right one the first time. If you buy a brushless motor, you'll need a dedicated controller, and it's generally best to stay with the motor manufacturer's recommendation. Many controllers for both brushed and brushless motors have multiple functions that may or may not be user-selectable, such as brakes and BEC, so ask questions before you buy, and buy right the first time.

I prefer a high-quality motor, such as a cobalt/neodymium or brushless motor. I know lots of folks use the cheaper "can" ferrite motors that do a good job in the right application and setup, but they won't last as long as better motors will or handle the abuse as well. If there's enough interest, I will go over some excellent uses for ferrite motors in a future column. For now, I'm assuming you hope to buy a system that you'll be able to use in several airplanes, so I will emphasize the higher-quality motors.

Brushless motors are by far the most versatile because many are made to handle a large range of cells, and they are more efficient than cobalt motors. The new MaxCim* MaxNEO-13Y can be used with 7 to 28 cells, depending on the controller and gearing; mine will handle up to 21 cells, which gives me a system I can grow with. Other systems and options can be viewed on MaxCim's website (www.maxcim.com). Aveox offers a wide variety of motor winds and has a virtual test stand on its website (www.aveox.com) to help you select the right combination. I have a few different Aveox systems for my helicopter and sailplane that allow me to use between 7 and 12 cells. AstroFlight has entered the brushless market in the last year or so with its 020 and 050 systems; details can be found at www.astroflight.com.



The Aveox Infinity charger can also cycle your batteries.

Brush motors do cost less, though. Of the Astro cobalt motors, I like the extremely versatile Astro 15G, which I've used in everything from a 10-cell direct-drive plane to a geared 14-cell plane. With the introduction of the new Astro Superboxes, the motor's range has been expanded even further.

WHERE DO I FIND THIS STUFF?

Don't despair; unlike years ago when we had very few choices, we now have many sources of electric gear. There's no way I can cover all the companies that have sprung up to cover particular interests in electric flight, so I'll try to provide an overview of the biggest companies that have the widest array of products.

New Creations R/C* has been around a while, and the owner, Kirk Massey, has specialized in electrics from the start. An experienced modeler, he knows the products and he stocks almost everything imaginable when it comes to electric flight gear. Repair service is also available for very reasonable rates, so it's a full-service shop. Although New Creations is mostly mail order, you can also walk into the shop if you're in the area. The catalog alone is a wealth of information on products and their capabilities.

SR is more than just batteries. Larry Sribnick ("Mr. SR") and Steve Anthony have been in electric flight forever (or so it seems); both are active modelers, so they can offer lots of expertise. They sell batteries, but they also stock a complete line of products to fill your needs and are always a joy to talk with on the phone. They'll soon be coming out with a couple of kits that look great, so if you call, be sure to ask about them, too. SR has also sponsored electric flight symposiums for several years at the annual KRC electric fly in Pennsylvania.

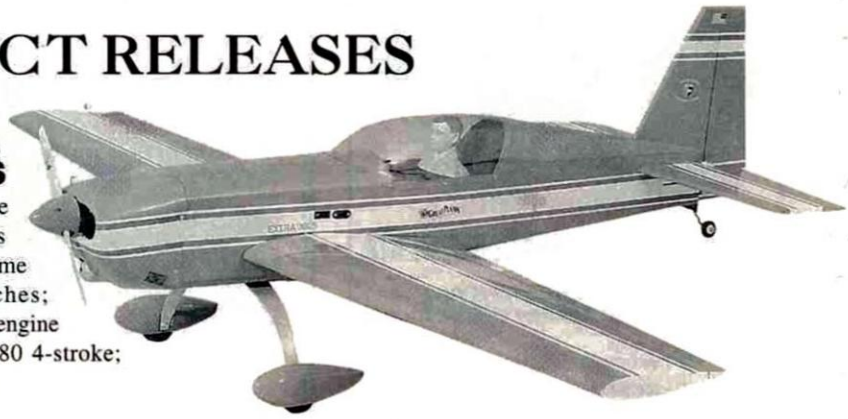
As far as I know, Hobby Lobby* has been importing electric flight equipment from Europe for longer than anyone. Jim Martin ("Mr. Hobby Lobby") is an electrics flier and can be seen at KRC with a big smile on his face as he runs from his booth to the flightline. Jim is knowledgeable in many aspects of R/C, but his personal interest has been electrics, and it shows in the Hobby Lobby catalog (if you don't have one, you need to order one!).

I'm rapidly running out of space, so we'll talk about some more sources of equipment next month and touch on some of the smaller, more specialized companies, too. There are just so many good places to find information and products, it's going to take a few months to cover them. Pick these guys' brains when you call, and tell them I sent you.

Check out the photos and captions for some exciting projects that readers have sent in. When you send photos, be sure to include all the details; copying a proven setup on a similar model is an easy way to be successful quickly. Write to me at 1016 Camberley Dr., Apex, NC 27502-8107, or email at greggimlick@mindspring.com.

**Addresses are listed alphabetically in the Index of Manufacturers on page 150.* ✚

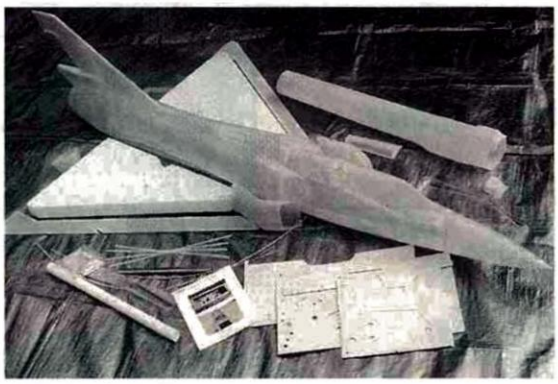
LATEST PRODUCT RELEASES



GREAT PLANES MODEL MFG. CO.

ARF Extra 300S

All major assemblies of this .40-size Extra are built and covered with MonoKote, and its one-piece ABS cowl and ABS wheel pants come painted. Specifications: wingspan—58 inches; length—48 inches; weight—5.5 to 5.75 pounds; engine recommended—.40 to .51 2-stroke or .48 to .80 4-stroke; radio required—4- to 5-channel with five servos.
Part no.—GPMA1240; price—$279.99.
Great Planes Model Mfg. Co., 2904 Research Rd., Champaign, IL 61826-9021; (217) 398-6300; fax (217) 398-0008; website: www.greatplanes.com.



USHER ENTERPRISES INC.

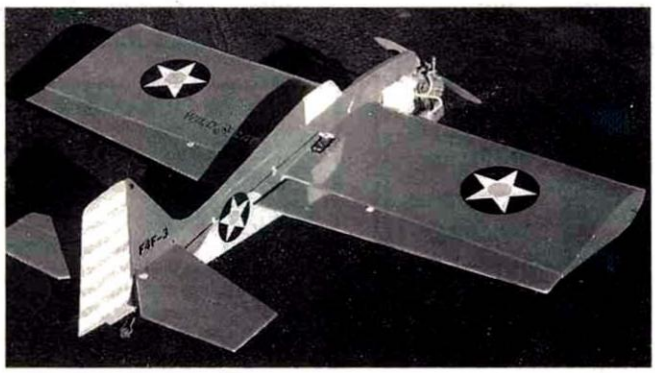
F-106

This 1/9-scale model has a 51-inch wingspan and 1,200 square inches of wing area. It weighs a little more than 16 pounds and has a one-piece, removable wing and nose. The F-106 is available with Dynamax or Viojett ducting.
Usher Enterprises Inc., Box 511, North Plains, OR 97133; (503) 647-0015; fax (503) 647-1015; email: usher@acsip.com.

GREAT PLANES MODEL MFG. CO.

PinDriver Installer/Extractor

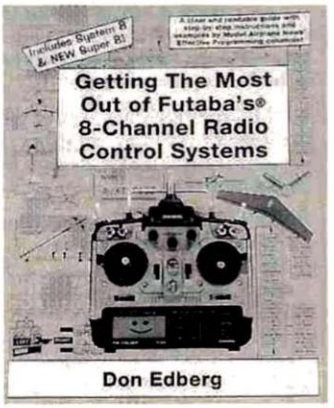
This ergonomic tool is designed to push and pull T-pins and eliminate thumb and finger fatigue. T-pins are held in the magnetized slot to be inserted; removal claws can reach T-pins in small recesses.
Part no.—GPMR8050; **price**—$3.99.
Great Planes Model Mfg. Co., 2904 Research Rd., Champaign, IL 61826-9021; (217) 398-6300; fax (217) 398-0008; website: www.greatplanes.com.



SKY BENCH AEROTECH

WILDest Cat

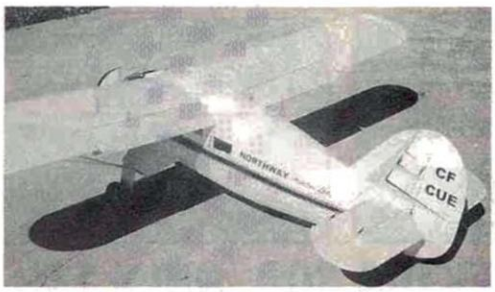
Designed by Bob Steele and featured as a construction article in *Model Airplane News*, this fun-fly profile Grumman Wildcat kit features laser-cut wing ribs, all necessary wood, shaped wire landing gear, plans and a construction manual. Specifications: wingspan—45.5 inches; weight—4 pounds, 5 ounces; engine recommended—.32 to .46 2-stroke; radio required—4-channel.
Price—$59.95 (plus $5.95 S&H).
Sky Bench Aerotech, P.O. Box 316, Washington, MI 48094; fax/phone (810) 781-7018; website: www.skybench.com; email skybench@teleweb.net.



DYNAMIC MODELLING

New Book

Model Airplane News columnist Don Edberg's 186-page book, "Getting the Most out of Futaba's 8-channel Radio Control Systems," is now available. It covers everything from basic 4-channel model setup to sail-plane functions to advanced programming.
Price—$19 ($20.20 for CA residents).
Dynamic Modelling, 9922 Rochelle Ave., Irvine, CA 92604-2941; (888) 770-1812; website: www.flash.net/~dynamic3.



IKON N'WST

Noorduyn Norseman

This 1/5-scale kit features working doors and flaps, hand-cut balsa and plywood parts, formed aluminum landing gear and fiberglass cowl. Decals are available for the 1974 Northway Aviation scheme.

Specifications: wingspan—102 inches; length—65 inches; wing area—1,450 square inches; weight—16 to 18 pounds; engine recommended—Moki 1.8, G-38, or 1.50 4-stroke.

Price—$385 (plus $14.95 S&H).

Ikon N'Wst, 3806 Chase Rd., Post Falls, ID 83854; (800) 327-7198 or (208) 773-9001.

KSJ

Fuel Filter Mount and Fuel Shutoff Clips

The fuel filter mount is designed to secure your helicopter's fuel filter directly to its frame so it won't become disconnected by vibration. It is compatible with all JR- and KSJ-type fuel filters and fits all helicopters. The fuel shutoff clips prevent engine flooding while you refuel.

Part nos.—KSJ645 (mount), KSJ221 (six clips); **prices**—$7.95, $2.95.

KSJ; distributed by Horizon Hobby Distributors, 4105 Fieldstone Rd., Champaign, IL 61822; (217) 355-9511; website: www.horizonhobby.com.

DAVE BROWN PRODUCTS

Vortech Spinners and Prop Adapter Nuts

These new aluminum spinners are precision machined, lightweight and come in seven sizes, from 1¾ to 3½ inches. They are designed to work with most models on the market. The new Vortech steel prop adapter nuts are CNC-machined and available in short, long and extra-long lengths; each is also available in six different crankshaft thread sizes. The nuts come with prop washers.

Dave Brown Products, 4560 Layhigh Rd., Hamilton, OH 45013; (513) 738-1576; fax (513) 738-0152; website: www.dbproducts.com.

MICRO FASTENERS

Ultimate Servo Hold-Down Screw

This socket head, washer head, pointed self-tapping screw (2x9/16 inch) allows you to install a standard-size servo without using a screwdriver. Its 5/64-inch hex socket allows you to use a ball- or straight-end hex wrench. The screw's washer head totally covers the grommet, eliminating the need to use a washer.

Also available are servo-arm screws (3x5/16-inch pan-head Phillips self-tapping screws).

Part nos.—STW0209 (hold-down screws), SMPP0305 (servo-arm screws); **prices**—$4.90 for 100, $4.50 for 100 (plus $4 S&H per $100 of product).

Micro Fasteners, 110 Hillcrest Rd., Flemington, NJ 08822; (800) 892-6917; (908) 805-4050; fax (908) 788-2607; website: www.microfasteners.com; email: microf@blastnet.

CARL GOLDBERG MODELS

UltraPaint® and EasyCoat®

UltraPaint® is a one-step, epoxy resin, aerosol paint that complements Ultracote and Ultracote Plus colors. It comes in a can with an adjustable nozzle spray and is resistant to fuels containing up to 15 percent nitro. EasyCoat® is a strong, polyester heat-shrink film that's easy to apply. It's available in 10 popular opaque colors, and each roll contains about 39 inches of material.

Prices—$4.99 per 6-ounce can (UltraPaint®), $13.99 per roll (EasyCoat®).

Carl Goldberg Models, 4737 W. Chicago Ave., Chicago, IL 60561; (312) 626-9550; fax (312) 626-9566.

CLASSIFIEDS

BUSINESS

PAYING $250 EACH for following toy metal outboard boat motors: Gale Sovereign 60hp, Oliver, Black Mercury MK-1000, Seafury Twin. Gronowski, 140 N. Garfield Ave., Traverse City, MI 49686; (616) 941-2111. [12/98]

MAKE YOUR OWN ROCKET MOTORS!!! Homemade solid and composite fuels, power R/C gliders, model rockets, etc. Smoke tracers for R/C planes and choppers, electric igniters, cannon fuse "chemicals," lab acids. Glassware, "how to" books, videos, rocket motor kits; huge catalog $2. Pyrotek, P.O. Box 300, Sweet Valley, PA 18656; (717) 256-3087. [1/99]

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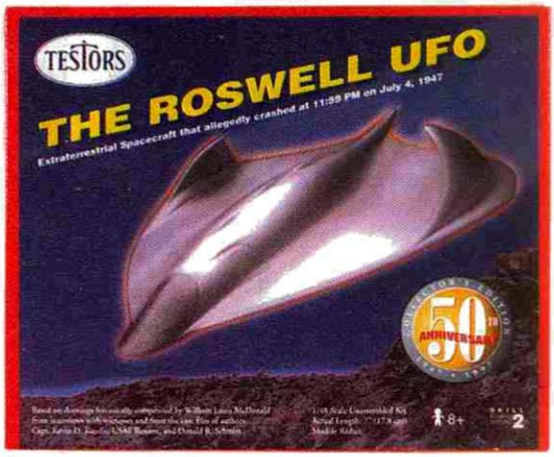
ROSWELL UFO FOUND IN CANADA



If you've never seen a UFO, check your local hobby shop! Can there be scale models of things that don't exist? Or do they?

Ray Brosinsky of Alberta, Canada, may very well be the first person to have officially flown a Roswell UFO, albeit in R/C form. This UFO is alleged to have crashed following a thunderstorm in Roswell, NM, in 1946.

Ray used three Testors "1/48-scale" plastic models of the Roswell extra-terrestrial air/spacecraft and reverse-engineered them to develop his flying version. One plastic model was built and left intact to serve as a 3D reference. A second model was cut into lengthwise sections, and a third was cut into spanwise sections. These cross-sections were used to develop a set of loftings that were configured into construction plans for the enlarged R/C version. Ray enlarged the scale of the plastic models eight times, making his model 1/6 scale.

Designer, reverse-engineer and UFO pilot Ray Brosinsky poses with his latest flying creation. Ray's model was inspired by the Testors plastic model of the UFO alleged to have crashed in Roswell, NM, in 1946.

Unable to uncover any usable information on the super-secret antigravity propulsion unit used in the full-size craft (or any Element 115 to fuel the device), Ray chose a Magnum .91 4-stroke engine to power his craft. The superstructure is made of wood, including balsa ribs and 1/16-inch balsa sheeting. The craft is 52 inches wide and 58 inches long, and Ray estimates that the model has 1,652 square inches of "wing" area. The finish is butyrate dope over Coverite fabric, and the finished, ready-to-fly weight is approximately 8 pounds. The engine compartment/cowl is made of fiberglass, while the two curved fins are made of foam covered with fiberglass and epoxy resin.

Flight controls consist of elevons that, according to Ray, work extremely well. The first flight of the model, as Ray puts it, was "a little on the hairy side," as the model had little or no yaw stability. Ray is in the process of attaching a clear Lexan fin to the model to improve flight performance.

The miniature pilot (seated) and passenger figures seen with Ray and his UFO are 1/6-scale "Greys," also from the Testors company.

An interesting side note to this story is that Ray and his wife, Joyce, have been running a craft and hobby store for 18 years in Rocky Mountain House, Alberta, Canada, but when we tried to contact Ray, the Canadian government denied the existence of the area! (Just kidding!)

—Gerry Yarrish

This 1/6-scale model of the famous Roswell UFO is an actual working prototype of the mysterious extraterrestrial craft. Note the 4-stroke, antigravity device attached to the front of the craft. It swings a Master Airscrew propeller.